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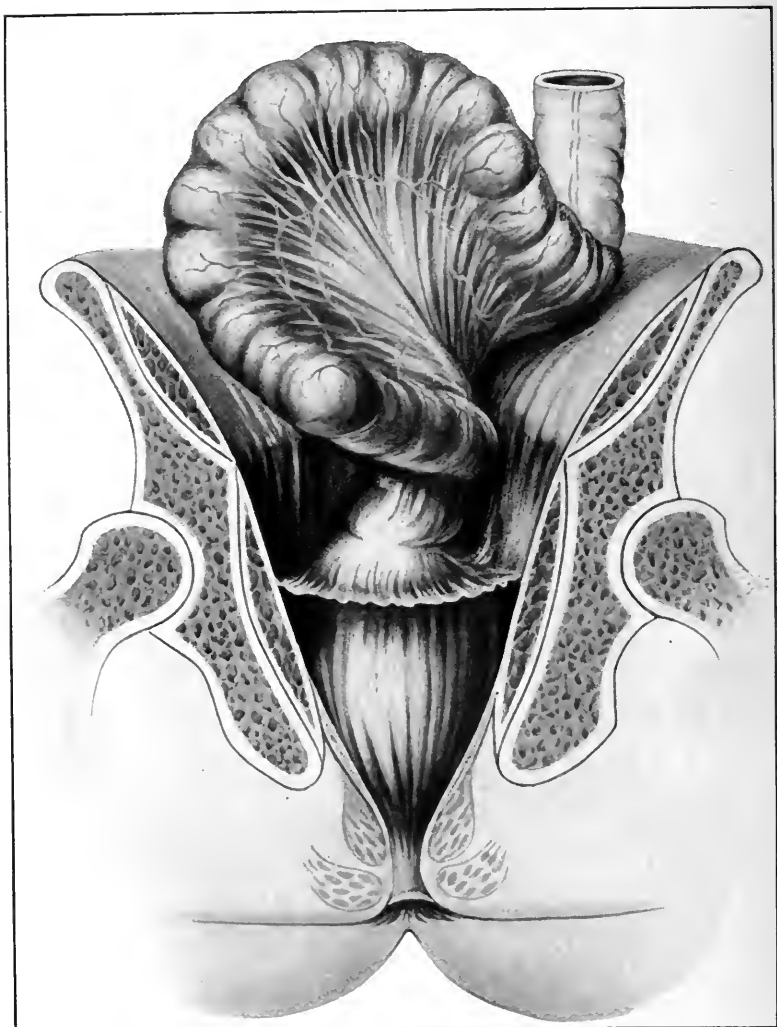
PLATE I. THE RECTUM AND PELVIC COLON.

DISEASES OF
THE RECTUM
AND PELVIC COLON

BY

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NEW YORK
E. B. TREAT & COMPANY
241-3 WEST 23D ST.
1913

THIS BOOK
IS GRATEFULLY DEDICATED
TO

JOHN GRIFFIN, A.M., M.D.

in appreciation of his never
faltering confidence and in-
terest in my scientific work.

PREFACE

The zealous purpose of mastering the relationship of proctology to the many ailments commonly treated by the general practitioner has been my aim during a long and varied practice. In this text I have attempted to simplify the descriptions of the common diseases of the colon, sigmoid flexure, rectum and anus, and to present them in the plainest and most direct language. Thousands of cases have been studied and the results of my observations and experience are here presented in an endeavor to draw attention to the frequent association of diseases of the rectum with faulty physiological conditions in the upper digestive tract, and to point out that gastric or intestinal disturbances are, in many instances, the direct predisposing causes.

The subject of hemorrhoids is considered as a gradual evolution of time-honored methods to those of the present day in which progressive ideas are linked in a practical manner with modern mechanical devices. A new theory as to the origin of hemorrhoids from a catarrhal inflammation of the rectum is also tentatively advanced for scientific consideration, and, if sustained, may give rise to a more careful analysis of intestinal disorders in an effort to find an acceptable etiological factor.

The chapter on " The Relation of Rectal Diseases to Gynecology " is one of the many special features of this work and I trust will be of interest and value. The importance of inquiring into these subjects is emphasized and it is pointed out that the diagnosis of rectal diseases in general does not present any greater difficulties to the average physician than other diseases, when a proper procedure is followed.

Perisigmoiditis and sigmoiditis are given prominence with the object of describing the pathological conditions which com-

monly affect the sigmoid, and, also, assisting in the differential diagnosis of the diseases found in the adjacent organs.

In the diagnoses and treatments given, I have included the views of the most eminent specialists as well as treating the subject from the standpoint of the general practitioner. The most modern operative technique is outlined, while obsolete treatments and operations are only referred to when necessary to show the progress made in the practice of proctology. A detailed description of the modified Tuttle abdomino-perineal operation for the removal of cancer of the rectum, and " The Tuttle three-step operation in tumors of the sigmoid colon " are included for the first time in any medical book.

It has been my purpose not to burden the reader with an exhaustive and unnecessarily technical treatise on this subject, but to condense the results of my practice, and the labors of other specialists in this branch of medicine into a book which covers the entire field in the most practical and comprehensive manner.

I am pleased to acknowledge my indebtedness to the many excellent books on the subject, including those written by Tuttle, Gant, Earle, Mathews, Ball, Goodsall and Miles, Wallis, Kelsey, Allingham, Hirschman and Hertz; also to several excellent articles which have been presented in our medical journals. In illustrating the text, Mr. Francis A. Deck has added to its practical value by his general knowledge of medical work.

MARTIN L. BODKIN, M.D.

290 Clinton Ave., Brooklyn, N. Y.
April 17, 1913.

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DISEASES OF THE RECTUM AND PELVIC COLON

CHAPTER I

ANATOMY AND PHYSIOLOGY

To aid in the surgical description and for the purpose of locating diseases in general as described in this text the following anatomical divisions will be adhered to.

THE ANAL CANAL

The Anal Canal is that part of the intestinal tract below the junction of the true mucous membrane with the skin. It is situated in the middle of the pelvic outlet on a level with an imaginary line drawn between the tuber ischii. The canal measures from two-thirds to one and one-half inches in length, is shorter when the rectum is distended, and extends from the true skin below to the free borders of the semi-lunar valves, or the ano-rectal line above. It lies in a downward and backward direction, making an angle of more than 45° with the horizontal. The outer coverings are composed of a prolongation of the rectal fascia, the internal and external sphincters, and the split levatores ani muscles, forming a muscular cylinder which is steadied by the anococcygeal body posteriorly. The ischi-rectal fossæ are situated on each side; anteriorly the base of the triangular ligament and the bulb of the urethra in the male, and in the female, the perineal body of the vagina and a mass of fat and muscular tissue.

Posteriorly, a dense ridge of skin, known as the anal raphe, extends from the anus to the coccyx, while in front of the

anus proper the perineal raphe is continuous with the raphe of the scrotum.

The interior of the canal is lined by a muco-cutaneous and mucous layer. The muco-cutaneous layer is richly supplied with terminal nerve ends and contains a few glands and blood vessels. The lower portion of the mucous membrane is composed of stratified, squamous epithelium, which gradually undergoes a change to the columnar variety at the linea dentata or ano-rectal line, marking the upper limit of the anal canal. At this point, the mucous membrane presents a dentated appearance due to from five to eight slight elevations above the surface of the mucous membrane which forms an irregular border between the rectum and the anal canal. The area is described by some authors as peculiarly supplied with nerve terminals giving rise to many reflex disturbances.

About one-fourth of an inch below the ano-rectal line, the lower end of the internal sphincter is marked by a poorly defined white line, techniquely known as Hilton's, which is almost imperceptible to the naked eye, but is easily discernible by the touch. This line is of importance as marking the junction between the internal and external sphincter muscles.

The External Sphincter Muscle. The anal canal is surrounded by the external sphincter muscle, which is voluntary and situated just beneath the skin at the anal margin, being so adherent to the skin, that care should be exercised against its removal with the skin. It takes its origin from the tip of the coccyx and after encircling the anus is inserted into the perineal body. The muscle is about one-half inch broad, is quite thin, and its fibers are penetrated by a portion of the longitudinal fibers of the rectal wall which separate it into an external and internal portion. These fibers form a plane upon which pus may burrow from a superficial ischio-rectal abscess to the rectum. The muscle is supplied by the fourth sacral and inferior hemorrhoid nerves.

The Internal Sphincter is situated just above the external sphincter muscle and is a flat, involuntary muscle, consisting of simply a number of the circular muscle bands of the rectum

grouped together at that point to form a muscle three-fourths to one inch in breadth and one-sixth of an inch in thickness. The internal sphincter muscle is regarded by most surgeons as the most important factor in fecal incontinence, be-
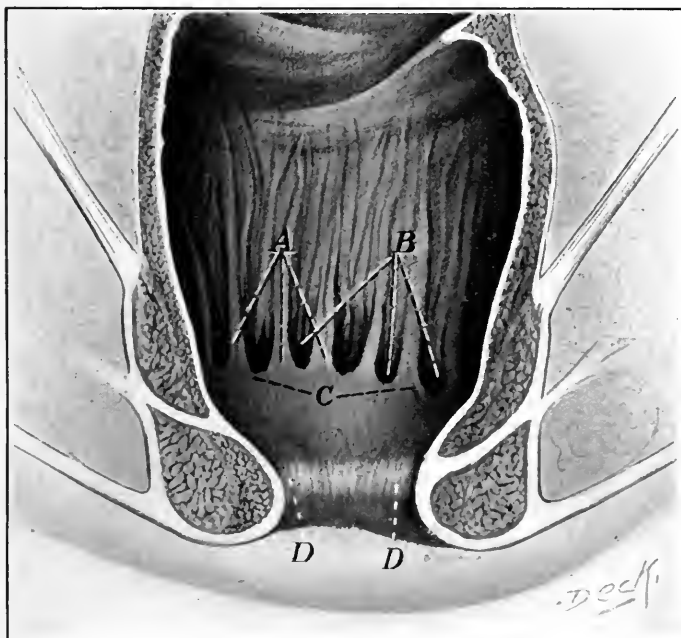
Fig. 1. The anal canal. A, columns of Morgagni; B, crypts of Morgagni or semi-lunar valves; C, dentate border, surmounted by papillæ; D, Hilton's white line.

ing purely an involuntary muscle which becomes useless if the normal muscular action is interfered with by destruction of its nerves or tissue.

The Levator Ani Muscle is a broad thin muscle which forms the floor of the pelvic cavity. It is attached to the inner sides of the true pelvis as far forward as the symphysis pubis; laterally, along the line of the obturator fascia and from the spine of the ischium, posteriorly, on both sides. It unites with the muscle of the opposite side to form the floor of the

pelvis. This muscle supports the viscera and the various structures contained in this cavity. It is inserted into the walls of the rectum and its fibers pass downward and backward to be inserted into the sides of the coccyx and lower part of the sacrum. Its fibers are interlaced at the lower ends with fibers of the external sphincter muscle which often permits the only weak point in the pelvic floor for the escape of pus from the pelvi-rectal fossa into the ischio-rectal fossa. The function of this muscle is to lift the anus and compress the neck of the bladder and urethra. Cripps demonstrates that the levator ani has some voluntary action which is shown by the control of the bowel existing after destruction of the external and internal sphincter muscles.

The Ischio-Coccygeus Muscle is described by anatomists as a separate muscle, but is considered by most rectal specialists as simply the posterior fibers of the levator ani muscle.

The Recto-Coccygeus Muscles, which represent two flat bands of unstriped muscular fibers, arise from the coccygeal ligament near the tip of the coccyx, pass forward, downward, and blend with the longitudinal muscle fibers of the rectum and pelvic fascia surrounding the anus. This muscle is supposed to be a tensor of the pelvic fascia and a retractor of the rectal wall.

THE RECTUM

The rectum is usually defined as that portion of the intestinal canal situated between the semi-lunar valves of Morgagni, where it pierces the pelvic floor and the point of attachment of the mesentery opposite the third sacral vertebra. This point marks the change in the blood supply, the division of the three longitudinal bands of the colon which become distributed around the circumference of the gut ; the narrowing of the lumen of the gut, and also, the movable from the immovable portion of the intestinal tract. The rectum occupies the middle of the pelvic outlet, forming in the majority of instances a double anterior-posterior curvature, the concavity directed forward in the upper portion and backward in the

prostatic portion. These lines of curvature indicate the direction ordinarily followed on the introduction of instruments, the finger being too short to permit such anatomical explorations. Ordinarily the rectum measures five inches in length in the normal adult which of course varies as we examine a tall or short person.

Some authors describe lateral curvatures corresponding to the plicæ transversales recti. Three flexures are most constant and quite readily noted when the rectum is distended, and appear as concavities to the left when viewing the highest and lowest. The middle concavity presents a curvature to the right which is the best marked of the three. These curvatures are dependent upon the Houston valves which hold the rectal walls so firmly that they are not smoothed out by the distention of the organ and can be artificially produced or exaggerated in this manner. This description of lateral curvatures, due to distention of the organ by fecal matter, or artificially, is therefore somewhat arbitrary. It seems to be of no practical importance excepting that they mark out the space between the valves and demonstrate the possibility of the function ascribed to them in the rectum as a receptive organ for fecal matter prior to expulsion.

The rectum is in relation posteriorly from above downward with the sacrum, coccyx, and the levatores ani muscles which are united beneath and behind, and known as the ano-coccygeal body. The rectum, when distended, comes in contact with the pyriformis muscles and sacral plexuses on both sides, being separated from the latter only by fat and connective tissue.

The Ampulla. The dilated lower portion of the rectum just above the internal sphincter extends upward for several inches to the lower limit of the peritoneum anteriorly and is called the ampulla. The ampulla, under some pathological conditions, such as atrophic catarrhal proctitis, is constantly dilated. Normally, this portion of the rectum acts as a sort of reservoir for the fecal contents and is the frequent site of ulceration, proctitis and malignant disease.

The rectum is covered by the peritoneum at its upper portion, therefore, it has peritoneal, muscular, submucous and mucous membrane coats.

The Peritoneal Coat extends as far as the attachment of the mesentery at the third or fourth sacral vertebra. Below this point it is in apposition with the pouch of Douglas anteriorly.

A well-marked peculiarity is that the portion below the peritoneal cover is commonly the seat of most of the diseased conditions. The movable rectum is confined to that portion situated below the peritoneal coat at the third sacral vertebra and ends at the point of attachment of the levator ani muscles.

Anatomical knowledge of the peritoneal relations, at the time of operation for prolapse of the rectum, carcinoma or other malignant growths, makes the possibility of infection of the peritoneal cavity a serious question. If these relations are understood, and the peritoneal tissue recognized at once, our technique and operative procedure may be changed to meet the anatomical conditions. The peritoneum extends anteriorly to within an inch of the prostate gland in the male, is then reflected to the posterior surface of the bladder, forming the recto-vesical fold. The upper third only is covered anteriorly and laterally, while posteriorly it is devoid of a serous coat, owing to the downward dipping of the peritoneum in front — not encircling the rectum completely. Its middle portion is covered only anteriorly and the lower third has no peritoneal coat whatever. In the female there is a reflection of the peritoneum from the anterior surface of the rectum to the vagina, at about one-fourth inch below its junction with the uterus. So that if we measure the distance anteriorly, the rectum is uncovered by peritoneum about three and one-half inches of its lower end, and, posteriorly from five to six inches, in the normal adult. In children the distance varies with the growth or physical formation of the child from one and one-half inches to the distance above stated for an adult. These distances will, however, vary according to the disten-

tion of the bladder or rectum, for in the adult a half inch may be safely added when the bladder is full.

In order to form a comprehensive idea of the different structures which lie in relation with the rectum it should be noted that in front, in the male, from above downward are the recto-vesical pouch, the base of the bladder, the vesicalæ seminalis, vasa deferentia and lastly the prostate gland. In the female the peritoneal reflection from the rectum holds it in contact with the vagina, while above, separating the rectum from the uterus and upper portion of the vagina, is the pouch of Douglas. Below the portion which is covered by the recto-vaginal reflection of the peritoneum, the rectum is covered by fascia, derived from a portion of the recto-vesical, formed from the pelvic fascia.

The Muscular Coat. The muscular coat consists of two layers, the longitudinal or external, and the internal circular. The longitudinal muscles seem to be the same as those of the colon above, excepting for their peculiar wide-spread distribution at the recto-sigmoidal junction. The longitudinal, or outer muscular coat, is arranged in three bands on the colon but as they reach the rectum these involuntary muscle fibers spread out into a continuous layer surrounding the bowel, and thicker on the anterior and posterior surfaces. These fibers are blended at the lower rectum with the two flat bands of unstriped muscular fibers on either side of the middle line behind, known as the recto-coccygeus muscles. At the site of the rectal valves the deeper fibers are infolded. The shortness of the longitudinal fibers on the anterior and posterior surfaces produce a certain amount of lateral sacculation.

The circular fibers become stronger and more abundant at the lower end of the rectum where they terminate in the form of a strong muscular band, known as the internal sphincter muscle. Anatomists have demonstrated the existence of a circular muscular band at the recto-sigmoidal junction, known as the valve of O'Beirne, who first described it.

The Submucous Coat consists of loose connective tissue in which ramify the blood vessels, nerves and lymphatics. This

tissue permits the mucous membrane to move freely over it.

Mucous Membrane. The mucous membrane is thicker, contains more blood vessels, and is less adherent to the submucous tissue here than at any other portion of the intestine.
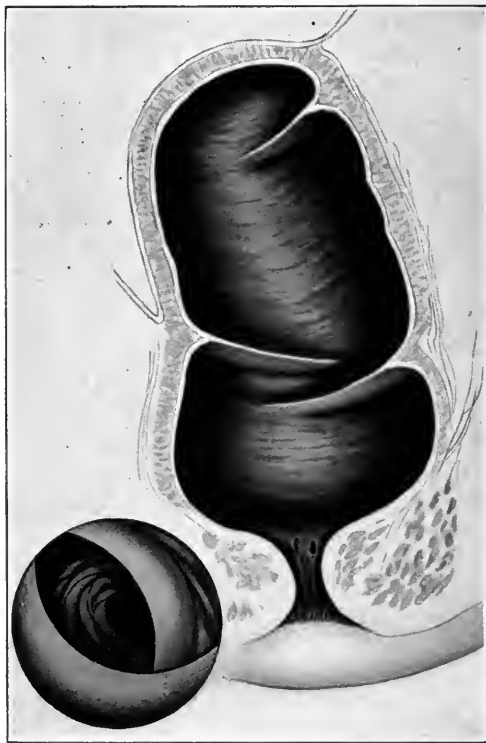
Fig. 2. Usual location of Houston's valves. Smaller picture shows valves as seen through the procto-scope.

This peculiar freedom of motion upon the underlying tissue is emphasized by the many folds the mucous membrane is thrown into by the fecal mass.

Houston's Valves. The rectal mucous membrane is thrown into from two to three prominent folds, described as Houston's

valves. Three of these valves are almost permanent anatomical structures, one anteriorly and two posteriorly. The inferior valve is situated about one and one-half inches above the ano-rectal margin and the superior valve is within the same left quadrant, posteriorly, about three and one-half to four and one-half inches above this line. These valves are so situated as to obstruct the fecal mass in its descent and in some instances are the cause of constipation, fecal impaction, and obstipation when hypertrophied. The function of these valves is supposed to be the support of the fecal mass prior to expulsion.

The mucous membrane is covered by epithelium of the same character as that of the intestinal canal above. Crypts of Lieberkühn and solitary lymphoid nodules, resembling the solitary follicles of the small intestine are found wide-spread in the rectal mucous membrane.

Columns of Morgagni. Just above Hilton's white line (muco-cutaneous junction) are situated several folds of mucous membrane, the Columns of Morgagni, Pillars of Glisson, or Columns of the Rectum.

Semi-Lunar Valves or Pockets are cup-shaped folds of mucous membrane suspended between the lower extremities of the Columns of Morgagni. Some authors describe blind pouches running upwards beneath the mucous membrane of these valves or pockets.

Papillæ. At the lower end of the Columns of Morgagni there are from ten to twelve elevations of the mucous membrane covered with stratified epithelium, which are known as the Papillæ.

Pecten. The transitional portion between the skin and the rectal mucous membrane, covered by stratified epithelium, is called the Pecten. In this narrow segment is supposed to reside a nerve sense governing the expulsion of the lower rectal contents or a special rectal sense.

ARTERIES, VEINS AND NERVES OF THE RECTUM AND ANUS

The Superior Hemorrhoidal Artery, derived from the inferior mesenteric, divides into two branches descending along the posterior wall of the rectum. This artery, at about the level of the promontory of the sacrum, gives off the lower sigmoidal which supplies the lower portion of the sigmoid flexure. The superior hemorrhoidal gives off a number of branches which anastomose with each other and with the middle hemorrhoidal, and quite often with the inferior hemorrhoidal arteries. The main branches of this artery take a parallel course.

The Middle Hemorrhoidal Artery supplies the middle third of the rectum and has its origin from either the hypogastric, prostatic or the anterior division of the internal iliac arteries. It descends to just above the levator ani muscle, which it supplies within the pelvi-rectal space. This artery supplies sufficient blood to the lower end of the rectum to maintain its vitality, when the superior hemorrhoidal artery is injured.

The Inferior Hemorrhoidal Artery. This artery takes its origin from the internal pudic and traverses the ischio-rectal fossa from the posterior outer wall, supplying the lower portion of the levator ani, the sphincter muscles, the skin and the superficial fascia of the anal margin. The branches of one side communicate with those of the other, and anastomose with branches of the middle hemorrhoidal artery.

The Middle Sacral Artery arises from the aorta posteriorly at its bifurcation. It descends along the middle line just in front of the sacrum and terminates in the gland of Luschka. It supplies the posterior surface of the rectum and anastomoses with branches of the superior hemorrhoidal and lateral sacral arteries.

The Veins. The corresponding names are applied to the veins which return the blood through the portal vein and the inferior vena cava. The superior or internal hemorrhoidal veins terminate through the mesenteric in the portal vein.

The middle and external hemorrhoidal and the middle sacral veins convey the blood from the outer portion of the rectum and anus, discharging it into the vena cava. The internal hemorrhoidal veins form a plexus which supplies the rectum proper, limited by the ano-rectal line. Below this line the external veins are located.
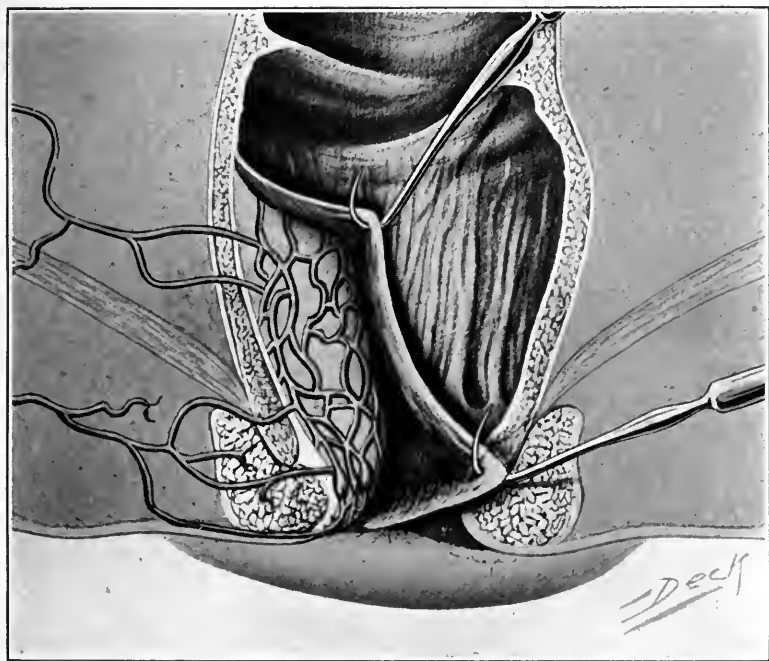
Fig. 3. Showing external and middle hemorrhoidal veins from lower end of the rectum and anal canal. Branches also run upward to form the superior hemorrhoidal veins.

The veins of this region are not supplied with valves and therefore congestion from local or hepatic diseases often results in hemorrhoids. The superior hemorrhoidal veins pass upward from Hilton's white line to a distance of about three inches, just beneath the mucous membrane, then perforate the muscular coat and pass to the outside of the bowel.

Verneuil claims that these muscular button-holes contract around the veins and prevent the return of blood to the liver, causing hemorrhoids. The internal hemorrhoidal plexus begins practically at the ano-rectal line, in the form of little
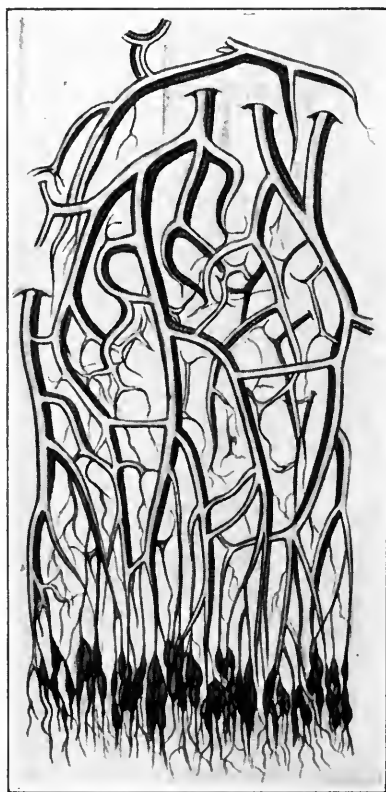
Fig. 4. Venous pools in which internal hemorrhoidal plexus arises (schematic).

pools, arranged like clusters of grapes, surrounding the columns of Morgagni.

The Nerves of the Rectum and Anus originate from the sympathetic and cerebro-spinal systems. Branches of the mesenteric, hypogastric and sacral plexus of the sympathetic,

largely supply the rectum proper. The mucous membrane of the rectum becomes progressively more sensitive from above, downward, possessing very little sensation in the upper portion. The longitudinal and circular muscles of the rectum are supplied from the second, third, fourth and fifth sacral
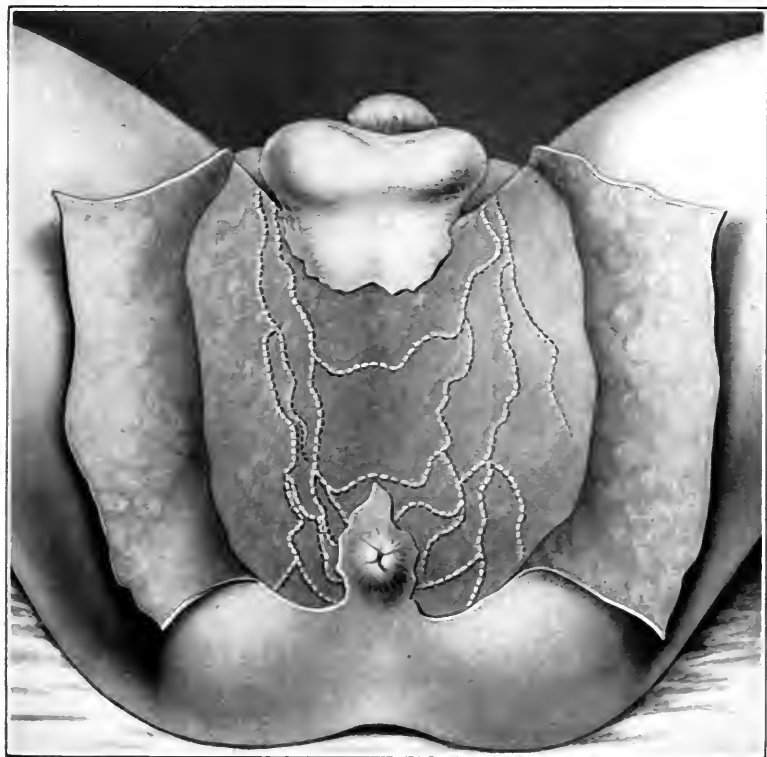
Fig. 5. Lymphatics of superficial anal region.

nerves. The levator ani is supplied by the third and fourth sacral nerves. The external sphincter muscle receives its nerve supply from the third, fourth and fifth sacral nerves which extend across the ischio-rectal fossa. The spinal nerves convey motor impulses to the longitudinal muscular coats but inhibitory impulses to the circular fibers.

The Lymphatics of the rectum and anus are formed from two systems — an external, which drains the skin and anus and empties into the inguinal, and the internal or distinct rectal system, which empties into the sacral-lumbar glands. This division explains the origin of infection of the inguinal glands from a superficial abscess around the anal region and the involvement of the deep lymphatics in cases of malignant disease of the rectum proper. They seem to be arranged similarly to those in the large intestine generally, that is, in a system comprising three plexuses — one for the mucous coat, another for the muscular and one for the serous coat. The muscular and serous plexuses drain into one another and into the adjacent glands, but the lymphatics from the mucous coat do not communicate with either of these before emptying into the adjacent glands. An important point to remember here is that the glands are found in two situations — in the hollow of the sacrum, and close to the gut. The lymphatics which lie along near the superior hemorrhoidal vein and its branches pass first into the adjacent glands, while the efferent lymphatic stream from these glands passes to the glands which are situated on both sides, internal to the anterior sacral foramina in the hollow of the sacrum. It is supposed that some of these lymphatics pass directly to the internal iliac glands.

THE SIGMOID FLEXURE

The Sigmoid Flexure is generally described in recent anatomical text-books as consisting of two parts, an iliac and pelvic colon.

The Iliac Colon is described as that portion of the descending colon extending from the left iliac crest to the brim of the pelvis; the pelvic colon that part which extends from the brim of the pelvis to the promontory of the third sacral vertebra.

The iliac colon passes downward in the left iliac fossa to a point just above Poupart's ligament, it then turns inwards above the psoas muscle where it becomes the pelvic colon.

The iliac colon has no mesentery usually, and the peritoneum covers only its sides and anterior surfaces. Sometimes just at the commencement of the pelvic colon it may possess a mesentery. It lies upon the psoas and iliacus muscles, measures about five or six inches in length and is usually covered by some portion of the small intestine, excepting when it lies lower. When distended it may reach the abdominal wall.

The Pelvic Colon is continuous with the iliac colon, as stated above, and commences at the inner side of the left psoas muscle, forms a loop, then turns downward to become the rectum opposite the third sacral vertebra. It varies much in length, measuring as a rule sixteen inches, and possesses a mesentery which is usually about five inches in length, but may be found to measure from two to ten inches. The mesentery is attached to the pelvic wall, and can be traced backward to the sacral-iliac junction then downwards and inwards to the median line where it terminates at the third sacral vertebra. This loop of gut is freely movable and found often in different locations. Commonly it lies in the pelvis where at its beginning it crosses the external iliac vessels, and rests upon the uterus of the female or bladder of the male.

The bowel presents some different relations in the infant, as the greater part of the pelvic colon is situated above the pelvic brim. Owing to the sigmoid loop crossing from left to right the colon usually enters the pelvis on the right, instead of the left side. The rectum is proportionately larger and straighter in the child than in the adult. The peritoneum reaches as low as the prostate usually, in the male infant.

CHAPTER II

GENERAL EXAMINATION

THE examination for the diagnosis of diseases affecting the rectum and anus is ordinarily looked upon by the physician and patient with a sense of repugnance, coupled with embarrassment. This is partly due to an inherited sense of shame to expose these parts, traditionally known to exist even in the savage races. Therefore, the physician usually hesitates to magnify the subject sufficiently to persuade the patient to submit to an ocular or digital examination.

The introduction of the finger or an instrument is associated with a hypersensitiveness often heightened by a traumatism. The degree of pain accompanying the examination is often dependent upon the dexterity of the examiner. In many instances the clumsy operator causes even more suffering to the patient than the disease itself.

When an ulcer, fissure or a sensitive hemorrhoid exists, the finger should be well lubricated and introduced on the side opposite the point indicated by the pain, then on withdrawal made to quickly pass over the objective point of examination.

More serious mistakes — the results of slipshod examinations — are made in the diagnosis of diseases of the rectum than in any other portion of the human body. This point cannot be emphasized too strongly and the criticism is more severe when the surgeon premeditately presumes to treat these cases in an ignorant manner. The constitutional and catarrhal affections of the intestine tend to be either limited, or they later afford many opportunities for the careful consideration of the patient's ailments, and an attempt at diagnosis on the first visit may not be absolutely necessary. When, however, the patient presents himself with a painful fissure, bleeding from

the rectum, or an acute inflammatory condition, he should be thoroughly examined in order to give him immediate relief, and, as a secondary consideration, for the protection of the physician's reputation as a competent practitioner.

It is not an uncommon occurrence for us to receive a patient from some professional friend, who has carelessly summarized a rectal condition, where an examination discloses a large septic area from an ischio-rectal abscess.

This criticism does not apply to cases presenting themselves for the treatment of a complicated fistula, or with the definite diagnosis of a chronic catarrhal condition, or the pathological nature of an ulceration, but it should include the knowledge that the patient is suffering from a rectal disease, which is either positively understood or a fair idea formed as to its nature. Rectal diseases are among the most common ailments of civilized humanity, and are probably given the least consideration.

These remarks are earnestly intended to direct the general practitioner to a more conscientious and careful examination of these unfortunates. He will be rewarded not only pecuniarily but with their deepest gratitude.

When we consider the manner in which the average human being lives, the luxuries and comforts afforded him, the social functions, the nervous strains and the diet faults necessarily encouraged by his environments, rectal diseases are a logical accompaniment of the worn-out body. Sedentary indoor occupations, unsuitable clothing, improper use of alcohol or the struggle for existence, interfere with the healthy physiological functions, or the proper nourishment of the body, and are a common cause of rectal disease.

Rectal diseases have been treated in the past by unscrupulous and unlicensed pile-doctors. Not having been considered a dignified branch of medicine or surgery, few cared to take up the study of such diseases, and, but for the efforts of a few practitioners of unquestionable ability and reputation these diseases would have been disregarded by, and almost unknown to the legitimate practitioner.

The preliminary oral examination of patients, as a rule, is worthless. Their descriptions are probably more meager than the ordinary information regarding common diseases. If the physician will realize this and take nothing for granted excepting the location of pain, the results, based upon further examination, will be immensely gratifying. In other words, the ordinary individual is more ignorant of the symptoms presented in diseases of the rectum and anus than is realized.

Local Examination by simply separating the buttocks may reveal in the anal ring or orifice, a fissure, hemorrhoids or pruritis ani, without the introduction of an instrument or the finger. When the disease is located higher up in the rectum or sigmoid, the proctoscope or sigmoidoscope may be necessary, but ordinarily the finger will suffice for the diagnosis of an indurated ulcer of the rectum, a stricture, a malignant growth, or polypi. However, the instruments which will be described later, form an advantageous addition to one's equipment, but are not absolutely necessary in all cases. In most instances the painful introduction of the speculum is entirely uncalled for, so that the average practitioner has little excuse in the majority of rectal diseases, even if the many instruments devised for diagnostic purposes in this region are not at hand. However, for the diagnosis of the catarrhal diseases of the colon, sigmoid or rectum, the sigmoidoscope is an absolute necessity, and will afford positive information if the psysician is familiar with the picture presented in analagous conditions of the throat.

The local examination of a patient for diseases of the anal ring may be indicated by the description of a localized pain or other symptom in that region — for instance, the pain of a fissure or the itching of a pruritis ani is definitely located by the patient. When the disease is high up where the rectum is less sensitive, the description becomes less accurate and is often described as an ache, or a feeling of heat in the rectum, accompanied by the characteristic symptoms of the disease. An ulcer of the rectum will be accompanied in some instances

with the discharge of pus and blood, and is often associated with a fissure, pruritis ani and rectal tenesmus.

The symptoms at times may be grouped together, as they are almost constant accompaniments of this disease and one might easily make a partial diagnosis by discovering a fissure or pruritis ani and leave the ulcer undiscovered. This point will emphasize the necessity for the introduction of the finger or proctoscope, to exclude the presence of the ulcer. A fissure in ano or pruritis ani, in many instances, is secondary to an irritation of the rectum, sigmoid or colon, so that a fissure would simply be one of the indications for a more thorough examination and study of the disease. Pain shooting down the legs is very often associated with rectal diseases, and coccycodynia is often the reflected irritation of a hypertrophic catarrhal proctitis.

Symptoms. Diseases of the colon, sigmoid and rectum are, as a rule, manifested by the presence of indigestion, flatulence, loss of appetite, irregularities of the bowels or protracted constipation. Each of these disorders produce characteristic symptoms of disturbed physiological balance, as well as local manifestations in the form of the mucous crisis, of mucous colitis, or a weak and dyspeptic condition, the result of an atrophic catarrhal condition in whom the assimilation of food results in emaciation and weakness, aggravated by severe constipation.

The presence of spasmodic or periodic dysuria in the genito-urinary tract without an apparent cause, may indicate the presence of a disordered digestive apparatus associated with a catarrhal condition which brings about auto-intoxication and irritation. The presence of mucus, blood, or pus in the fecal discharge should in all instances indicate a proctoscopic or sigmoidoscopic examination. A tendency to diarrhea, and in fact the regular movements of the bowels before breakfast, will indicate irritation of the sigmoid and warrant an examination.

Sensations of constrictions or weight in and about the pelvis, particularly in male subjects, would warrant investiga-

tions. An examination should be made of the heart, chest, kidneys, and the urine in all instances of protracted colitis.

Sometimes the amelioration of either form of a colitis is dependent upon the rectification of a physiological disorder in either of these organs. Kidney and heart disease, in my experience, have been the underlying cause in a few cases.

One should question the patient as to the state of the bowels, getting accurate information as to whether the bowels are regular, and whether this regularity is disturbed by a periodical diarrhea, which would indicate a catarrhal condition.   Pain varies with the different affections in this region, from the sharp pain of the fissure brought on at stool to the less severe pain of an ulcer high up.   The pain may be described as acute, cutting, burning or a dull ache.   If one remembers that acute pain is seldom found higher up than the muco-cutaneous junction, its location can be fairly made as a disease of the rectum, rather than the anal canal.

Special Preparation. The special preparation of the patient in most instances is not necessary for an examination which is not intended to include the rectum and sigmoid. Ordinarily, the separation of the buttocks will reveal diseases affecting the anal ring. When an examination of the rectum, colon and sigmoid is intended, the patient should be directed to avoid taking a laxative on the day of examination. It is a better plan to instruct him to move the bowels with an enema an hour or two before examination, the idea being to offset the loose, wide-spread liquid movements which follow the administration of a laxative. A simple enema ordinarily cleanses out the lower portion of the bowel very much more effectively than laxatives.

A Simple Enema. An enema to be most effective should be not less than two quarts of fluid, either plain water or soapsuds, and the patient should be directed to lie upon the right side or in the knee-chest position when it proves very effectual. The fountain syringe should not be elevated more than two or three feet above the body so as to avoid too great force. Various devices have been made for this purpose, but the

ordinary fountain syringe serves every purpose for giving rectal irrigations or enemata. It is provided with tips which are most suitable for the purpose. An enema may be given through a medium-sized, soft-rubber catheter or a Wales bougie. The question as to the use of long rectal tubes or catheters for the purpose of giving colonic or sigmoidal irrigations is probably settled as being unsatisfactory, for the long

Fig. 6. Sims's position with patient assisting in exposure of anal ring.

tube or catheter in almost every instance curls upon itself in the rectum and is of no more service than the short tip of the fountain syringe which reaches beyond the sphincter muscle. The position of the patient makes the thorough cleansing of the entire large colon an easy matter when no obstruction exists.

Resinous cathartics and glycerine act as irritants to the mucous membrane of the rectum and should never be ad-

ministered prior to examination, as they often exaggerate the condition. Glycerine, on account of this irritating property, is of service when the protrusion of the hemorrhoidal area is desired prior to an operation in the office under local anesthesia.

The Position of the patient will depend upon the condition of the disease in most instances. Affections of the anal orifice can be determined in the knee-chest position, or Sims's position, most easily.

Sims's Position (left lateral) is best suited for the examination of the colon, sigmoid, or rectum with the sigmoidoscope but is varied according to the individual idea of the examiner. The patient is probably more comfortable and less embarrassed in the Sims's position than in any of the other positions.

The Exaggerated Lithotomy Position is seldom used excepting for fistulæ which involve the recto-vaginal outlets. This position is one most commonly used by American surgeons when operating under a general anesthetic; the English surgeons prefer the Sims's position.

The Knee-chest Position (genu-pectoral) has been less commonly used since the invention of the pneumatic instruments for the examination of the rectum and sigmoid. With the old instruments the inflation of the bowel had to be brought about by assuming this position. When the patient is put in the knee-chest position, the abdominal organs readily fall towards the diaphragm, not only permitting the entrance of air, but straightening the rectum and part of the sigmoid. When one has only the old-fashioned instruments for the examination of these patients this position will be found quite satisfactory.

The Trendelenburg Position is of service in operating under a general anesthetic, when the abdomen is opened for the extirpation of a malignant growth or any surgical procedure necessitating the exposure of the rectum and the adjacent organs. This position of the patient under such circumstances is readily indicated and the surgeon is usually forced to an appreciation of its value.

Office Arrangement. Physicians who intend to give their conscientious attention to rectal diseases should provide such surroundings as will afford an opportunity to carry out the work properly. If possible the location and arrangement of offices should provide for a reception, a consultation, an ex-
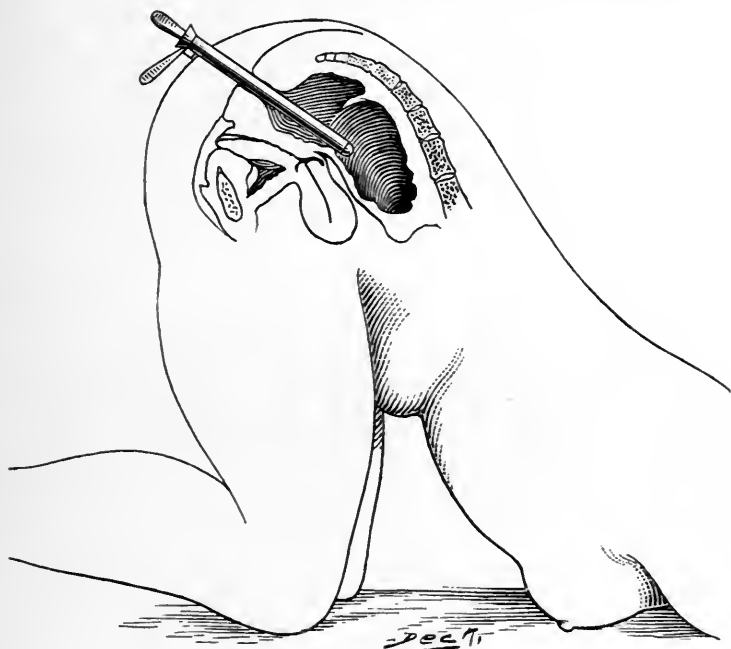
Fig. 7. Knee-chest position.

amining or operating, and a recovery room. The recovery room is an absolute necessity in the treatment of rectal diseases, gynecology, or any surgical treatment that causes the patient pain or weakness. The recovery room will not only prove valuable for the rest and comfort of patients, but will afford an opportunity for the treatment of another subject during the time that might otherwise be spent with a patient after operation.

The operating and consulting rooms should be, if possible, somewhat away from the reception room. The operating

room, for rectal work, should be patterned after those adopted by hospitals and sanitariums and provided with tiled or enameled ceilings and walls, lavage and a sewer connection just under the operating table. The latter will allow irrigations to be carried from the operating table to the sewer without flooding the floor. The location of the operating and examining rooms should be one that will provide the best light during the office hours in the afternoon or morning. A white interior with as little wood work as possible will give the patient the impression of cleanliness and make cleanliness necessary, as any slight soiling will be conspicuous. The furniture necessarily consists of a surgical table, sterilizer stand and other requisites which may be added according to the ideas of the physician.

The Examining Table. An examining table is preferable to the surgical chair. There is no doubt but the patient is much more comfortable when examined upon the table, not only from the advantage to the examiner, but from the sense of greater security. The chair in which the patient is placed, put into the recumbent position by means of a crank, then turned on the side or in the knee-chest position, is very confusing, embarrassing, and intimidating to many persons. It seems that the simpler and stronger the examining table can be made the more reassured the patient is of getting through the ordeal without pain. It must be remembered that many individuals have never undergone an examination for rectal troubles and they are exceedingly awkward in assuming even the simplest position. Often patients will turn on the abdomen when instructed to turn on the back, or become confused as to the right or left side, and there is a certain amount of danger of having them roll off the table before they have assumed the proper position. They are all more or less nervous and excited and in fear of pain. Should an ordinary kitchen table be used a cushion should be provided to counteract the hardness of the table and at the same time protect the patient's buttocks. The tables built by W. W. Allison and Clark & Roberts Co. have all these requirements, and can be used for

minor operations if necessary, by simply protecting the cushions with the Kelly pad.

The Light. A suitable light for illuminating the rectum, either by the aid of a head mirror or the proctoscopic instruments, should be provided. A most satisfactory light which may be reflected by the head mirror can be provided with the Welsbach burner and ordinary illuminating gas. Acetylene gas, used in specially designed lamps, is a most satisfactory light where circumstances force one to put up with the annoyances of these devices. A gas bracket lamp provided with a number of joints which can be turned into almost any desired position for external examination, fitted with a strong magnifying glass and reflector, makes a very useful device. Head and reflecting mirrors are especially useful in the examination of the rectum and for locating fistulæ and fissure of the anal ring. The reflecting mirrors used by the throat specialists, with the long handle bent at right angles to not obstruct the view, can be introduced into the proctoscope.

Specula. The choice of a speculum for rectal examination is ordinarily a matter of much concern to the inexperienced examiner for fissures, fistulæ, pruritis ani and hemorrhoids, but the use of the speculum is often unnecessary as either the sight or sense of touch is sufficient to make a diagnosis. Ulcerations higher than the external sphincter may have to be examined with the speculum. The ordinary Sims's speculum, used by the gynecologist, is a most practical instrument for diagnosticating ulcers in the lower part of the rectum and anal canal. Bivalve specula such as the Sims's rectal speculum, O'Neil's rectal speculum and many others, are ordinarily associated with so much pain when an attempt is made to open the valves of the speculum, that their use, without an anesthetic, becomes less as one gains in the practical knowledge of examination.

Conical fenestrated specula are intended to permit the mucous membrane or hemorrhoidal mass to enter the opening in the speculum for injection or other forms of treatment. The blades of the bivalve speculum are very apt to pinch the folds

of mucous membrane or hemorrhoidal mass, causing considerable pain. These instruments ordinarily give but an imperfect view of the lower four inches of the rectum. The vaginal Sims's speculum, when small, can be introduced on the side opposite to the lesion in the rectum or anal canal and permits a good view of the affected region. This instrument cannot be used satisfactorily excepting with the patient in the knee-chest position. The Van Buren's rectal speculum is a modification of Sims's vaginal speculum by the removal of
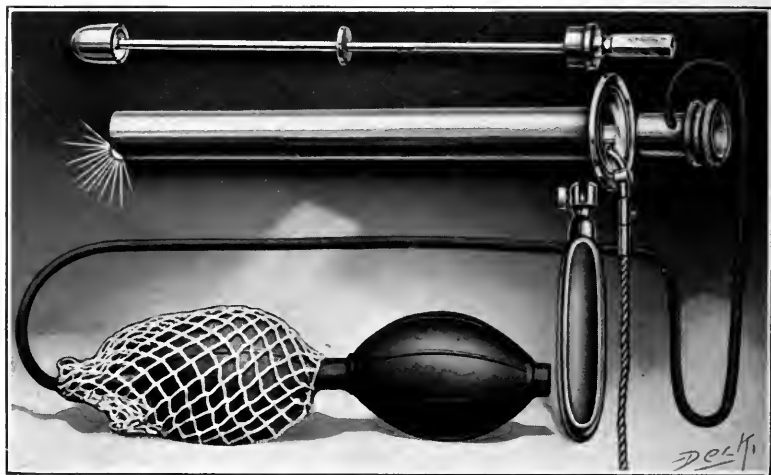
Fig. 8. Tuttle's pneumatic proctoscope.

one end and the addition of a straight handle, so that the buttocks will not interfere with its introduction.

The Ferguson tubular vaginal speculum was formerly used by introducing the rectal bougie through it as an obturator, and removing it when the instrument was passed to the desired point in the rectum. It served as a very satisfactory instrument, similar to the recent instruments devised by Kelly.

Proctoscopes. The inflation of the rectum with air for the purpose of introducing these instruments was first suggested by the experiments of Marion Sims in 1845, when he demon-

strated the possibilities of inflating the vagina for examination, and our rectal surgeons at once applied it to the examinations of the sigmoid and rectum. Van Buren, Bodenheimer, Tuttle, Allingham, Otis, Law and many others have popularized this method by modifications which have made these instruments of practical utility.

The Law, Pennington and Beach proctoscopes are closed with glass caps through which the operator may view the interior of the rectum or sigmoid and at the same time keep the
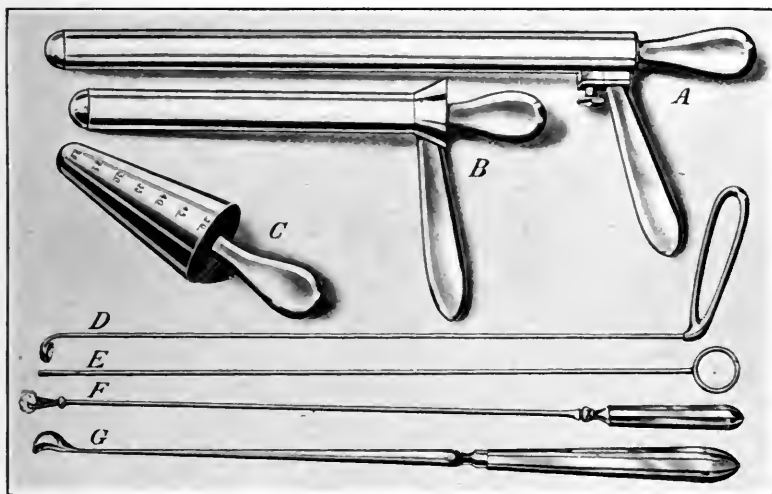
Fig. 9. Kelly's instruments for examining the sigmoid and rectum. A, sigmoidoscope; B, proctoscope; C, dilator; D, curette; E, applicator; F, sponge holder; G, scoop.

organs inflated by means of a rubber tube and bulb. Tuttle's proctoscope is a modified Kelly's tube, the obturator is small so as to give its end the Mercier curve, which, it is claimed, lessens the difficulty in rounding the sacral promontory when entering the sigmoid.

Proctoscopes and colonoscopes of any variety should always be provided with an obturator which is round on top and well fitted to the tube. Otherwise, the instrument when introduced will cut and injure the rectal wall and prove most dan-

gerous. Force should never be used in their introduction as there is danger of rupturing either the rectal wall or the anal canal. These instruments are made with different lengths of tubes for the examination of the rectum and sigmoid or colon, and of differing diameters most valuable in the treatment of the affections found in this region. The knee-chest position is always essential when the ordinary proctoscope is used. The Law's instrument has proved satisfactory to me, as it is simple in its construction and very easily cleaned and repaired.

Proctoscopes and sigmoidoscopes are made with a small electric lamp, screwed to the end of the lamp carrier. The carrier is made long enough to reach the end of the tube and when the lamp is in position it illuminates the portion of bowel inflated beyond the lamp.

Probes of various lengths and thicknesses are necessary for the examination of fistulæ in order to measure the depth and the course taken by these tracts. Ordinarily a short probe of five or six inches length is sufficient, but occasionally when extensive burrowing has taken place which is also very tortuous, the silver bullet probe is almost indispensable. The bullet probe, when made of silver, can be rolled up and easily fitted into the ordinary pocket instrument case.

Bougies in graduated sizes are indispensable in the determination of rectal strictures, as they indicate the diameter

Fig. 10. Wales's soft rubber rectal bougie.

of the bowel lumen and also the distance from the anal orifice at which the stricture is located. The Wales soft-rubber bougie is the one in common use, made in various diameters and about twelve inches in length. The bougie is hollow in the center so it may be used to carry an irrigating fluid above a stricture or impaction. These instruments should not be used blindly or forcibly introduced into the rectum as there is great danger of rupturing the wall. Sometimes the bougie

will curl upon itself in the same manner as the ordinary rectal tube. When this occurs the bougie should be introduced through the proctoscope.

Dilators for the purpose of examination are seldom of any benefit, as stretching the sphincters to the degree necessary to view all of the anal canal, without a general anesthesia seldom proves a success. The metallic conical dilator devised by Dr. H. A. Kelly, is a most satisfactory instrument, as the dilatation is gradual from the cone-shaped top to the broader base. This instrument, however, has proved most useful to me while the patient was under a general anesthetic prior to rectal examination.

Dilatation with the fingers is the old method, but owing to the uneven pressure, it is very painful and will not assist one in finding a lesion at the upper limit of the anal canal. Dilatation at the anal orifice for any purpose will not permit a view of the rectal wall sufficient to give any correct idea of lesions in that region, and when it is intended to overcome the forcible contraction of the sphincters due to a fissure or ulcer, the method is so painful that it can hardly be approved of unless under general anesthesia. This method of examination with the idea of viewing the rectum or anal canal is most unsatisfactory as a rule, and the physician will find the use of Sims's vaginal speculum, with the patient in the knee-chest position, the best method of procedure when no anesthesia is used. This posture admits of the entrance of air into the rectum, allowing it to fall away from the anal ring and stretching. it to its full extent; then the speculum can be moved from side to side in order to view it.

Roberts' Dilator. Gradual dilatation of the anal canal may be accomplished most satisfactorily with the ingenious device of Dr. D. Roberts of Brooklyn. It consists of a dilatable rubber bag somewhat of the shape of Barnes' cervical dilator. The instrument is entirely under the control of the operator, affording him the opportunity of gradually dilating it and exerting the force in the proper direction without pushing the tissues ahead of the dilating bag. The smoothness of the in-

strument permits dilatation of the anal ring, which is not fol-
lowed by any tendency to spasm. The muscles are gradually
tired out and relax without causing a traumatism.

The apparatus consists of a rubberized cloth in a bag with
ends made bulbous to prevent slipping outward or inward
when distention is complete. A tube is attached to this bag, to
the end of which is fastened a small stopcock with a hand bulb
and valve to prevent the backward passage of air. Inside the
bag and extending through the portion of the tube, a slender
metal rod is inserted to give the collapsible bag sufficient
rigidity while it is being introduced. A thin elastic cover,
free from seams, is placed outside the strong dilating bag to
give smoothness. The method of using this dilator is very
simple and directions are hardly necessary except that the
amount of pressure and the rapidity of dilatation should be
determined in each case by the physician. It is good practice
to dust the bag with talcum powder or smear it with vaseline.
When pain is experienced the stopcock may be turned to al-
low the escape of the air in order to relieve the involuntary
spasm of the sphincters. When full dilatation has been made
the bag should be left in place for ten or fifteen minutes, al-
lowing a complete relaxation of the sphincter muscles. This
dilator may be applied to strictures with greater safety than
can be accomplished with more forcible means, as the instru-
ment seems to be under the control of the operator at almost
all times and is less painful.

Rectal Scoops or Spoons are of great value in removing
fecal impactions which occur in old people. A small sharp
scoop, after the pattern of the ordinary uterine curette, which
can be used for scooping off or curetting ulcers as well as for
the removal of fecal concretions, is of much value.

Applicators and Dressing Forceps are often of use in rectal
examinations and should be long enough to reach through the
proctoscope up to the field of observation. Applicators may
be of the ordinary wood variety or made of German silver.
The wood applicators are cheap and there is very much less
danger of injury to the rectal wall in their use. A small piece

of absorbent cotton is twisted on the end, and by a little care and dexterity it can be made so tight that it will not slip off. Dressing forceps, long and straight, with handles slightly bent downward so as to not obscure the view, are the most useful if used through the sigmoidal tubes. A long alligator forceps is of service sometimes in reaching small foreign bodies or polypi.

Irrigators. Apparatus for irrigating may vary from the ordinary douche bag or fountain syringe to the more elaborate instrument of the genito-urinary specialists. Irrigations are intended to medicate the colon, sigmoid or rectum and when instituting the regular treatment of catarrhal inflammations located in the bowel, an apparatus for this purpose becomes an absolute necessity. A simple and inexpensive apparatus for irrigating the bowel should be part of the paraphernalia for treatment of diseases of the rectum. The reservoir containing the irrigating fluid should not be elevated more than two or three feet above the body of the patient, otherwise the fluid will run into the bowel too rapidly and cause expulsion. The patient may be placed upon the right or left side, or in the knee-chest position; the latter will be found the most effective for flushing the entire colon.

An ordinary hand ball atomizer of the design used for throat and nose work will be found a most valuable instrument for treatment of sigmoiditis or proctitis with the different solutions recommended for such diseases. These atomizers are powerful enough to throw the spray through a ten or twelve inch tube to the diseased area.

ANESTHESIA

The subject of anesthesia in the operative treatment of rectal diseases is one that is dependent in most instances upon the technical knowledge of the case under consideration and the dexterity of the operator. In other words, the correct diagnosis of a small fistulous tract will make it possible to operate under local anesthesia or nitrous oxide gas; whereas

general anesthesia is required if the diagnosis is not positive, and when the operator does not know how much tissue he is to incise, or feels uncertain as to the complications. When only a single hemorrhoid is to be removed, local anesthesia in the form of cocaine or eucaine will often suffice. When more than two hemorrhoids or an extensive fistula is to be operated upon, local anesthesia is not advisable, as the mere handling of the tissue soon causes the patient to resist treatment, and proper surgical technique becomes impossible. Ether or chloroform may be used in all extensive and prolonged operations for the relief of rectal diseases, and their relative value and dangers are so well known they need not be discussed.

Nitrous oxide and oxygen or laughing gas is an anesthetic which I think might be used by rectal surgeons in general with great satisfaction. In a limited experience with it when operating on hemorrhoids and fistulæ, I have not a single recollection that would tend to prove it anything but a safe and efficient anesthetic, and it seems to me that I should have used it oftener were it not that ether narcosis had become a habit. There is much less shock and depression with nitrous oxide gas than with ether or chloroform and the patient regains consciousness within a minute or two after the administration of the anesthetic is ended. Symptoms of vomiting and depression of the heart or respiratory centers seldom or never occur. Its use is also indicated in performing colostomy or in the closing of an artificial anus, the incision of fissures, the removal of hemorrhoids, the dilatation of the anal ring, or strictures, the removal of polypi and many other operations which do not require more than fifteen or twenty minutes to accomplish.

When we consider that laboratory investigations have shown conclusively that chloroform and ether impair phagocytosis and produce anemia, rectal operations, which certainly are more liable to infection, require the best effort in this direction. Nitrous oxide gas does not interfere with phagocytotic action so that the patient's resisting power

against infection is not lowered, and the vital energy is conserved. The administration of nitrous oxide is so pleasant that as a rule patients readily submit to an operation with the idea that it will not prove any more serious than the extraction of a tooth.

The best local anesthetics for rectal operations are cocaine, eucaine, alypin, quinine and urea hydrochloride and liquid air. Cocaine and eucaine should not be used in strengths greater than four per cent. not only on account of their poisonous qualities, but because anesthesia should always be produced with that strength. Ethyl chloride has been advocated for rectal operations, but I wish to condemn its use, as the freezing of the mucous membrane produces pain, and the pain after the incision of the tissue is again very severe.

CHAPTER III

EXAMINATION OF FECES

THE examination of the fecal dejecta in the diagnosis of diseases of the rectum is only of value in corroborating the conditions made visible with the aid of our modern instruments for examination of the rectum and sigmoid. Examinations of this character are only of great value to the internist for diseases of the system at large. One is informed, with the aid of the microscope, of the presence of such specific germs in the fecal mass as the amœba, gonoccocus, tubercle or an over-production of the bacillus communis coli. The relative value of these examinations for diagnostic purposes varies with the particular field of inquiry. In some cases the information is of no assistance but aids by the elimination of the causes of other possible diseases which manifest similar symptoms, such as might be presented in either typhoid or an ordinary simple catarrhal inflammation.

Microscopic Examination of the feces ordinarily reveals the digestive residue germs and other elements gathered as the mass travels through the intestinal tract; or there may be present foreign bodies which have been swallowed in the form of fruit pits, coins, buttons, etc.

The color of the fecal discharge in the healthy adult will vary according to the diet. A diet composed largely of meat, results in a dark brown stool, while a vegetable diet will give a yellowish color. Normally, the reaction is alkaline, but this is dependent upon the character of food eaten and the fluids excreted by the intestinal tract. Children that are fed mostly or altogether upon milk have yellowish or light brown stools. Drugs may affect the colon — calomel producing a greenish stool, rhubarb, santonin, or senna producing a yel-

lowish tint. These medicaments will vary the color in accordance with the amount of the drug taken. The quantity of bile secreted will vary the color of the feces to shades of yellow or green.

The Average Evacuation takes place once in every twenty-four hours, but this is not an invariable rule as many persons in perfect health do not evacuate oftener than once in forty-eight hours. In some conditions, due to disease, these intervals vary from four days to a few weeks. In other instances of ulceration or catarrhal diseases of the intestine the movements occur as frequently as twenty times in a single day.

Ordinarily the feces of the healthy adult are of a pasty or dough-like consistence, which is molded to the shape of the rectum. Digestive disturbances quickly change the dejection from the usual firm mass of constipation to the characteristic liquid alvine discharge of intestinal irritation.

With the aid of the microscope many other constituents may be observed in addition to the color and form. Blood, pus, and mucus in large quantities are easily recognized as such. The seeds of fruit and vegetable matter often appear unchanged. Pieces of vegetables, fruits, nuts and pills may pass through the digestive tract without either proper mastication or digestion.

There may be found gall stones or enteroliths from deposits of calcium and magnesium salts around a foreign body as a nucleus. In persons suffering from mucous colitis, mucus may be found in the form of long, structureless, firm, whitish molds of the intestine. When an ulceration exists in the intestine, fragments of the mucosa may often be found in the stools.

The characteristic odor of normal feces is due mostly to the presence of indol, skatol, methane and sulphuretted hydrogen, the result of the digestive process or bacterial action.

Parasites are easily recognized in the stool by the naked eye as they are common constituents of the intestinal canal. Undigested foods as well as material thrown off by the intestinal mucous membrane, starch granules, tissue fibers, fat

globules, blood corpuscles, micro-organisms and triple phosphate crystals may be seen under the microscope as normal ingredients of the feces.

In pathological conditions, bacteria may be found in enormous numbers, as in typhoid fever, or cholera. In tubercular ulceration of the intestine the tubercle bacilli may be found in the feces.

The microscopical elements of the normal fecal matter consist largely of numerous varieties of bacteria. Most prominent are the *bacillus proteus vulgaris* and the *bacillus coli communis,* none of which appear to be harmful to the healthy intestinal tract. But recent investigation seems to prove that symptoms of auto-intoxication are due to their toxines when the number is greatly in excess of the average, as commonly observed in simple catarrhal inflammations of the intestine.

The animal parasites form the most important elements to discover in the examination of feces under the microscope. The ameba of the protozoa are considered the most important in the causes of intestinal diseases, as so many of these intractable dysenteric diseases simulate amebic infection, that it is always a great help in the diagnosis when they are eliminated from the causes. The amebæ are often found in the stools of a normal person and may increase in number as the fecal evacuations become more alkaline. They are found imbedded within the mucus or the edges of the characteristic ulcer. The amebæ coli cannot be distinguished from the proteus ameba so common in water. It consists of a mass of protoplasm without a cell membrane, a nucleus and one or more vacuoles. When examined the stool should be fresh and kept nearly at the body temperature, as the vitality of the ameba is very little, even at 70° F. Specimens may be kept for further examination if a small quantity of sodium carbonate be added to the mass and then kept at the body heat.

Fatty crystals are abundant in the fecal discharge of nursing infants, in the stools of alcoholics and those suffering from jaundice. Fatty acids and soaps may be seen in large amounts.

The Bacterial Organisms found in the stools of healthy individuals are very numerous and of different varieties, and while in some forms of intestinal disease the bacteria are present in great numbers it would seem, in some instances, that their sole effect upon the body is due to their toxines rather than the direct invasion of the tissue by the living bacteria. It is impossible in most cases to attribute these intestinal diseases to any invasion by a single type or variety of these bacteria. The commonly mentioned bacteria recognized as etiological factors are the *streptococcus, staphylococcus, bacillus pyocyaneus, lactis aerogenes* and the *bacillus coli communis.* Other specific bacteria are found associated with diseases of recognized systemic character, such as typhoid fever, Asiatic cholera, diphtheria and tuberculosis. The *bacillus aerogenes capsulatus* may also be found in the feces.

THE DIAGNOSTIC VALUE OF FECAL EXAMINATION IN SOME FORMS OF INTESTINAL DISEASES

Cancer of the Colon, sigmoid or rectum does not present any diagnostic features, which are revealed by microscopic examination. The microscopic examination of a section of the growth, the clinical history, local examination, the discharge of blood, pus and mucus are the only safe guides to a diagnosis.

Intussusception of the Sigmoid or complete prolapse of the rectum are diagnosticated by local examination independently of the fecal discharges which are due to traumatism rather than any bacterial factor.

Syphilis, when present in the rectum, will reveal the systemic infection at some other portion of the body as well as at that point, in the majority of cases.

Amebic Dysentery is probably the most important of all the bacterial factors to be diagnosticated by means of fecal examinations. This disease is pronounced when the movements are very frequent, sometimes numbering from ten to twenty

each day, associated with severe pain along the intestinal tract and in the rectum. The fecal discharges are usually stained with blood and are small, frequent, fluid evacuations, containing a large amount of mucus. The reaction of the amebic stools is always alkaline, which is necessary to the life of the bacteria. The microscopic examination reveals tissue fragments, blood, mucus and the ameba.

The Shiga and Flexner bacilli seem to be the cause of another type of specific colitis which is not understood at the present time.

Typhoid Fever, while a systemic disease outside the realm of rectal diseases, is to be considered in the differential diagnosis during its mild, or late forms, when associated with diarrhea. The general symptoms of this disease, the leucocytosis, and the Widal test for the presence of the disease as manifested in the blood, is the safest manner in which to reach a diagnosis. The danger of infection to the examiner is unwarranted because of the simple methods now in vogue.

Cholera is characterized by the " rice water " in stools and the *comma bacillus*. The dejections of cholera are almost devoid of fecal matter and coloring material.

Diphtheritic Colitis is always associated with a diarrhea when the disease has progressed for a short time. The stools are composed of necrotic tissue, blood, pus and mucus.

Tuberculosis of the intestine may not be revealed by a single microscopic examination of the feces and, in fact, it is often necessary to make a number of examinations to discover the bacilli. This is probably due to the lack of opportunity to submit a specimen of the involved tissue for examination and to the small amount present. Tubercle bacilli may be present in the stools of a person suffering from pulmonary tuberculosis, in which case the sputum swallowed is sufficient to cause their presence in the stools.

Catarrhal Jaundice usually causes the stools to become firm and clay-colored. Fat is found in a large quantity in the form of tufts or needle-like crystals in the form of sheaves.

Nervous Diarrhea may be present in persons suffering from

neurasthenia and is indicative of an abnormal peristalsis in both the large and small intestine. The stools are frequently as many as from five to ten each day, which may alternately be solid or fluid in consistence. The patients often have a periodic sudden desire to empty the bowel, particularly at certain meal times.

Chronic Hypertrophic Colitis is characterized by the discharge of mucus in the feces after severe colicky pain (mucous crisis) which is usually relieved by the evacuation. The mucus discharges sometimes resembles the lumen of the bowel and are commonly called casts. Often these attacks are associated with constipation or followed by it. The feces present no other characteristic than the large amount of mucus.

Acute Catarrhal Diseases of the small intestine usually exist without causing a diarrhea unless there is an involvement of the colon. Affections of this type of inflammation which involve the ileum alone may not be associated with diarrhea, as the natural reservoir in the transverse and descending colon give ample time for the absorption of the fluids before evacuation. Lesions which involve the small intestine usually give rise to the formation of large quantities of gas. The stools are firmly formed, contain hyaline mucus and undigested food.

Acute Catarrhal Colitis is generally accompanied by large, liquid, soap-like evacuations of mucus. The mucus is not bile-stained as may be found in the stools which accompany acute catarrhal disease of the ileum.

CHAPTER IV

GENERAL DIAGNOSIS

An attempt is herewith made to group the rectal diseases commonly existing together; to differentiate these diseases when occurring separately, and to suggest others that might present similar symptoms. A reference should then be made to the more comprehensive description of the disease in the text to further assist in the diagnosis and the treatment.

Malformations of the Anus should be looked for at the time of birth by every conscientious attendant, and this important habit or system of examination should be included in the regular duties of the accoucheur. An examination which reveals total obstruction prior to the ingestion of food and intestinal putrefaction gives these infants the only opportunity for operation when the colon is free from bacterial growths.

Statistics lead us to believe that about one child in every ten thousand is born with some deformity in this region. The rectum emptying into the vagina forms fully half of the malformations so that the examination of infants at birth should be regularly made by the attending physician instead of depending upon the nurse, who in many instances has no idea as to the character of the deformities to be sought in this region. Her only knowledge of a disturbance in the natural function is the total absence of the discharge of meconium. Nor does it include the ability to diagnosticate deformities that would cause the discharge of fecal matter at some unnatural place, as the vagina or urethra. Usually she will not make such a discovery during the first day, and is apt to wait until the physician calls on the following day before making a report. The small finger of the average adult hand will do

no harm when introduced into the rectum of a newly-born infant.

Deformities of the anus are easily discerned by an ocular and digital examination. Either a total absence of the normal anal canal will be noticed, or a depression at the proper site will be found. When a membranous occlusion, either partial or complete, is present, a bulging caused by the pressure of the retained meconium is evident. If the occlusion is located higher up in the anal canal at the pecten, the diagnosis may be delayed until symptoms occur, if the finger is not introduced. Malformations of the rectum which do not permit fecal discharge manifest the defect within twenty-four or forty-eight hours, and give rise to the general symptoms of intestinal obstruction. The condition of the child is then exceedingly grave and surgical aid is imperative. When the deformity is such that the end of the rectal pouch is situated an inch from the normal site of the anus no impulse will be felt at the perineum, but when the distance is less it is usually elicited. When the rectum empties itself into an adjacent organ — the bladder, vagina, urethra, or uterus, the discharge of meconium at an abnormal place will be noticed. An examination at the time of birth would in this instance relieve the attendant of adverse criticism and prepare for the proper course of treatment.

Catarrhal Diseases of the colon, sigmoid and rectum are usually manifested by digestive disturbances, constipation, diarrhea, or both, with the discharge of blood, pus and mucus. Atrophic catarrhal colitis is commonly associated with constipation, the result of diminished mucus secretions, but this is not invariably the rule until the condition is very severe, and of long duration.

Rectal Polypi. As a rule, the first indication of the existence of rectal polypi, when located low down, is the occurrence of tenesmus after defecation or when the mass happens to engage the sphincter muscles. Their presence is usually sufficient to make defecation painful from the pressure upon the swollen and eroded mass. Blood will be discharged when

sufficient injury has been done to the polypus to erode the mucous membrane covering it or the surrounding rectal anal or rectal wall. Fissures are often a complication existing with polypi. A proctitis is often excited as the result of the irritation caused by the presence of polypi which acts as a foreign body. The diagnosis can be made only by rectal examination with either the finger, speculum or proctoscope. Digital exploration will easily detect the pedicle. Rectal polypi are usually single unless of the myxomatous type which are found high up in the rectum or sigmoid. Malignant growths are not pedunculated and tend to surround the gut involving the epithelial layer. Polypi have been mistaken for rectal prolapse on visual examination but are easily differentiated by examination with the finger.

Pruritis Ani may be confused with marginal eczema (ring worm) and when suspected, a microscopic examination will affirm the diagnosis by finding the fungus (*trichophyton*). The widespread characteristic involvement of the superficial tissue occurring in pruritis ani, and the intense intermittent itch, will render a diagnosis easy. Pruritis ani is secondary to some constitutional or intestinal disease.

Abscess Formation in the rectum, when in the deeper tissues, will often present symptoms of pain which are most indefinite as to exact location. When an abscess is forming in the ischio-rectal fossa it will sometimes simulate the pain of a fissure or a bruised hemorrhoid. The chief symptom is pain, which may be indefinitely located, but is peculiarly constant and increasing in character until relief from the pressure is obtained by the rupture or an incision of the abscess. Palpation may reveal fluctuation and swelling. Fever is a constant symptom in all abscess formations of any size and, when noted, will assist in the establishment of the diagnosis.

Fistula may give rise to symptoms of irritation within or outside of the rectum, resulting from the discharge of pus or the interference with the normal contraction of the muscles situated within the area affected by its presence. When sus-

pected, it is well to remember that it may terminate in any part of the rectum, upon the skin, or into a neighboring organ and give rise to symptoms accordingly. Pruritis, rectal tenesmus, painful defacation, and irregularity of the bowels are very common symptoms associated with fistulæ which discharge their contents into the rectum or anal canal. External incomplete fistulæ seldom give rise to more than a slight degree of discomfort because of the opportunity afforded the sufferer to keep the parts clean with water.

Affections of the Sigmoid Flexure are characterized by pain in the left inguinal region of the abdomen. Pain in this region is quite as significant of sigmoidal disease, as pain occurring in the right inguinal region is of appendicitis, only not as frequently involved. Affections of the sigmoid may be mistaken for ovarian disease or a left-sided appendicitis. The indurated sigmoid, " iliac roll," or " sausage shaped " roll are indicative of the chronic affections. Perisigmoiditis is an acute suppurative affection, characterized by symptoms resembling appendicitis which demand immediate operation.

Obstipation and Fecal Impaction are interchangeable terms used to denote the complete or partial arrest of the regular fecal movements usual to the individual. The condition arises when there exists some growth, deformity or narrowing of the intestinal canal that causes a mechanical interference with the contents of the bowels. Impaction is generally understood to be an accumulation of hard fecal material at some particular point, by organic narrowing or spasmodic contraction of the intestinal canal. Either obstipation or fecal impaction indicate a partial intestinal obstruction and give rise to symptoms similar in severe neglected cases.

Prolapse of the Rectum, as observed in the incomplete variety, suggests the picture of large swollen hemorrhoids, which it resembles pathologically as it is simply an exaggerated protrusion of the normal mucous membrane. Hemorrhoids are lobulated and usually bilateral. Polypi are easily recognized by the finger as a pedunculated mass. An invagination of the upper part of the rectum, or third degree prolapse, may

be distinguished by the concentric rings, cone-shaped, and the distinct space which exists between the wall of the anal canal and the protruding mass. The finger may be easily introduced and passed around the entire circumference of the invaginated mass while in the other forms of rectal- prolapse the mucous membrane is continuous with the skin of the anal margin.   Rectal hernia may complicate intussusception of the rectum, and can usually be recognized by the gurgling due to the contained gases.

Malignant Growths are diagnosticated by being hard, nodular masses, or of cauliflower shape, and only protrude when forced downward by a large fecal mass. A fecal impaction producing this effect upon the growth can usually be felt through the abdominal wall.   Patients are, as a rule, emaciated at this period of malignancy.

Stricture of the Rectum is easily diagnosticated when located within the range of the finger tip, but when higher up the diagnosis becomes more difficult and the aid of the sigmoidoscope is necessary.   Many cases have been treated for stricture when later examination showed only hypertrophied Houston's valves.   In examining for stricture the bougie is of very uncertain value as it is very apt to bend upon itself when it comes in contact with the stricture and confirm the belief that no constriction exists.   The chief symptoms of stricture of the rectum are constipation, obstipation and fecal impaction.   It may be spasmodic which is very unlikely or due to a malignant or non-malignant growth.

Malignant and Non-Malignant growths may be differentiated by the following points:

Non-Malignant	*Malignant*
1. A disease of adult life, but may occur in children.	1. A disease of advanced life usually.
2. The tissue feels like a hard ridge or a polypoid growth, pedunculated.	2. New growth masses feel like distinct tumors or as flat plates, within mucous membrane.

Non-Malignant	*Malignant*
3. Ulceration when present does not greatly indurate the edges.	3. Ulceration evident when growth is breaking down.
4. The constriction includes the entire circumference.	4. Involves one side of the circumference more than the other.
5. Pain due to fecal impactions complained of during defecation only.	5. Pain is the result of involvement of the sensory branches of sacral nerves.
6. No glandular involvement.	6. The sacral lymphatics are enlarged and hard late in the disease with cancer, and early with sarcoma.

These growths are hard, nodular masses or of the cauliflower shape which protrude from the anal orifice only when forced out by a fecal impaction. The impaction can usually be felt through the abdominal wall in these emaciated subjects.

Fissure in Ano. Syphilitic fissures are usually situated laterally, and are multiple in the form of several small and a single large one. The lymphatics of the inguinal and femoral region may be enlarged. A blind internal fistula may be mistaken for a fissure, as both are attended with pain and tenesmus. The blind internal fistula pain is constant and exaggerated at time of defacation; and is continuous until the discharge of pus from the fistulous tract; afterwards, there is little pain for a variable time excepting when the bowels move. This cycle of pain recurs again within a period of a week or two and repeats the same symptoms. On digital examination a small amount of pus may be squeezed out, and found on the surface of the fingers, after withdrawal. The untrained finger cannot easily detect the edges of a fissure unless greatly indurated, but the localized pimple or indurated tissue about the orifice of the fistula may be distinguished between the index finger in the rectum and the thumb outside.

This indurated surface is never so sensitive as the floor of a fissure. It is possible to insert a small probe into the fistulous opening, but, as a rule, considerable dexterity is required to accomplish its introduction and withdrawal without causing great pain to the patient.

A fissure is simply a longitudinal ulcer extending from the muco-cutaneous junction upward, and it is quite unnecessary to see its upper limit to make a positive diagnosis. Retraction of the skin about the anal orifice with the fingers suffices in the majority of cases to reveal the fissure. A fissure is usually so sensitive to the touch, and manipulation of the parts is so apt to excite spasm of the sphincter muscles, that the quicker the examination is made, the more likely the patient is to return for further treatment. It is a common experience to have sufferers refuse the completion of the examination. Such patients are the hardest to control under these circumstances, and will try one's patience and skill in the endeavor to make a satisfactory exploration of the lower rectum, when the co-existence of a fistula is suspected. Both lesions may be present at the same time, in which case the internal opening will be found in the floor of the fissure.

Pain Reflexed from a neighboring organ may simulate fissure by causing painful defacation. In men, diseases of the genito-urinary organs, the bladder or prostate; or in women, a retro-verted or retro-flexed uterus or a prolapsed and inflamed ovary, may refer pain to the anterior median anal commissure, thereby, simulating fissure. In about one-fifth of the cases of fissure met with, internal hemorrhoids are also present, so that examination for piles or fissure should include a search for both. When hemorrhoids exist with fissure, they are usually soft and easily compressed, otherwise the hard, bulging mass of organized hemorrhoidal tissue acts as a dilator and almost always permits healing of the fissure. Bleeding from a hemorrhoid is more profuse than from a fissure.

Hemorrhoids, when ulcerated, may be confused with fissure, when the diagnosis of the patient is accepted by the physician,

who thereupon attempts the wrong treatment. Otherwise, the diagnosis is never difficult, nor can a mistake be made in the positive recognition of either. Piles are single, or multiple, segmented tumors, protruding directly from the mucous membrane of the anal canal. In some instances hemorrhoids resemble the incomplete prolapse of the rectum, but in cases of prolapse, the mucous membrane around the entire circumference is involved in the protrusion. Sometimes, a partial prolapse co-exists with hemorrhoids, but is more of an edema, the result of irritation, than a distinct type of prolapse. The operations for hemorrhoids readily relieves the prolapse by relieving the hemorrhoids — the cause. Polypi can be easily distinguished by the pedicle attached to the mucous membrane.

When hemorrhoids or a polypus interfere with defecation, the feces are evacuated from the opposite side of the aperture, while in prolapse of either variety, the fecal mass is discharged through the center of the protruding mass.

Foreign Bodies, usually located in the rectum, produce pain within a short time after their introduction, particularly when the point or edges are sharp. The diagnosis is sometimes made very difficult on account of the refusal of the patient to give any information as to their introduction, or, when insane, the unconsciousness of having committed the act. If the foreign body is smooth, local reflexes, hemorrhages, proctitis, tenesmus and constipation may follow. In some, symptoms of obstruction supervene. As a result of the injury, an abscess may follow the presence of small, sharp pieces of metal, glass or wood. The diagnosis must be made with the finger, or proctoscope.

Hysteria is distinguished from neuralgia by more constant pain, of a burning character and confined to a local area. Hyperesthesia or hysteria of the rectum is defined by intense pain over the affected spots. In neuralgia, the soreness produced on pressure is not so great, is more wide-spread and reflexed, as a rule, to the coccyx. The suffering caused by hysteria is sometimes mistaken for the pain of an ulcer.

CHAPTER V

GENERAL SYMPTOMS

THE symptoms and general points in the diagnosis of the common affections of the colon, rectum and anus are herewith grouped together in order to assist in understanding the correlative position of these diseases.

Local and Reflex Symptoms in this region are, in some instances, so accurately defined that one hardly needs more than a suggestion of the chief symptom to form an idea as to the area affected. For instance, severe pain after defecation is almost pathognomonic of fissure in ano and is generally located by the patient in the anal orifice. There may be at the same time reflex pain, described as a soreness in the buttocks or extending down the inner side of the legs. Many individuals suffering from an anterior median fissure will unconsciously empty the bladder in response to an impulse originated at that point — this is also reflex. It is the common experience of surgeons to have to catheterize patients after hemorrhoid operations, due to the traumatism in the rectum affecting the nerves of the bladder. A hard kick or an injury to the perineal region generally inhibits the physiological act of urination.

A Melancholic Condition of the mind is generally noted in persons suffering from protracted rectal and anal diseases. This mental condition is probably due to the effect of pain and embarrassment. They usually hesitate to discuss the subject of their trouble with others and choose to bear their suffering without advice or sympathy. The mental conditions of persons suffering from painful rectal diseases, such as fissures, hemorrhoids and ulcerations, is quite characteristic and constant. There is a depressed state of mind which depicts

a most forlorn, helpless and discouraged individual, particularly when repeated failures of cure have been experienced. These sufferers are often incapacitated for the ordinary occupations of life, and, when men of business, sometimes fear the loss of their employment from the disinterest in commercial affairs due to their misery. Those suffering from marked constipation, associated with fissures or painful hemorrhoids, probably suffer from a mental depression most frequently. Irritability of temper, sleeplessness and indigestion usually accompany pruritis ani.

Constipation is a relative term used to denote the slow movement of the bowel contents. Obstipation, fecal impaction and partial intestinal obstruction may be confused with acute constipation. The causes may be classified as deformities of the rectum, anus and intestine, over-distention of the intestine from gases, deficient food supply, excessive excretions from the skin and kidneys, enterospasm, weak abdominal muscles, painful affections about the ano-rectal region, and habit. The symptoms are due largely to auto-intoxication in the form of indigestion, flatulence, and eye-strain in the adult. Children and infants suffering from constipation, either in the acute or chronic form, are liable to convulsions, night terrors, day terrors, teeth grinding, bed wetting, and hypocondriasis, reflex symptoms brought on by the intestinal disturbances.

Incontinence of Feces is sometimes mistaken for diarrhea when the description of the ailment is accepted by the physician without due consideration of the causes other than the catarrhal diseases. It is common in transverse myelitis and in all paraplegic conditions due to an injury of the spine in the lumbar region. Sometimes it occurs as a transient symptom in the severe prostration associated with acute and chronic diseases, as often manifested during the course of typhoid fever, cholera infantum, tuberculosis, and some cases of acute gastro-enteric infection and pneumonia. Incontinence of feces is a common accompaniment of dyamic nervous condition arising from any cause.

Incontinence resulting from any of these causes may later change to an obstinate constipation. The relaxed and inactive sphincters may allow the escape of the bowel contents, but by its inactivity, associated with the loss of sensation in the rectum, permit the feces to mass themselves, causing an impaction. This condition is then aggravated by the lessened secretion of mucus and the mass becomes caked. Incontinence of feces, associated with incontinence of urine, is one of the symptoms of a Jacksonian epilepsy and helps to distinguish it from other similar seizures.

Painful Defecation is usually associated with all the diseases in or about the anal canal and the lower portion of the rectum. The degree of pain varies with the disease. Fissure or thrombotic hemorrhoids located on the muco-cutaneous junction almost without exception give the most pronounced history of pain. Proctitis of the chronic types do not cause more than a soreness at the time of defecation. The fear of pain at defecation is a common cause of apparent constipation in children, and in turn tends to aggravate the primary affection, as when the hard-retained stool is evacuated, tearing or bruising a fissure. The pain may last for an indefinite time, often bringing about a general nervous reflex disturbance in the form of indigestion, and interference with nutrition.

Painful defecation is probably more commonly associated with hemorrhoids than any other ailments as they are the most frequent in occurrence, but the pain is not of the severe, cutting type manifested with ulcer or fissure, excepting when the hemorrhoid is strangulated or of the thrombotic type. The acute onset of the thrombotic hemorrhoid commonly suggests an abscess formation.

Rectal Tenesmus is manifested by the constant, more or less painful, desire to empty the rectum. The phenomenon resembles the colicky expulsive efforts of colonic peristalsis in dysentery. It may be a symptom of an affection located in the rectum alone or partake of a general inflammation of the colon, sigmoid and rectum.

This symptom occurs with nearly all diseased conditions

which excite an irritating discharge in or above the rectum, as prolapse, ulceration, polypi intussusception, malignant and non-malignant growths. Foreign bodies cause a direct traumatism to the mucous membrane and excite expulsive efforts. Often the symptom is associated with the discharge of blood, pus and mucus. The condition is not always associated with liquid evacuations from the rectum as the fecal discharges may be natural in consistency until changed by the local inflammation.

Diarrhea is a common symptom of many rectal and intestinal diseases. It almost always accompanies stricture, carcinoma, ulceration, adenomata, prolapse, intussusception and the acute and chronic hypertrophic catarrhal inflammations of the colon, sigmoid and rectum. The specific inflammations of the intestine, dysentery, erysipelas, diphtheria, ulcerative colitis, follicular colitis and secondary membranous colitis are manifested by this symptom.

A diarrhea may be represented by a single liquid movement each day or, in the presence of an ulcerative colitis, by an almost constant evacuation. The disease may be regularly periodic, dependent upon a constant pathological condition with exacerbations.

Pain may accompany diarrhea due either to a lesion in the intestine irritated by the secretions or excited by rapid peristalsis.

Rectal tenesmus is most frequently caused by diarrhea — the result of the frequent irritating discharges, noticeably more severe immediately after the bowels have been evacuated. Diarrhea with temperature may indicate typhoid fever, malaria or the specific diseases of the colon. Nervous diarrhea may have its cause outside of the intestine, as the result of shock or a sudden chilling of the body. In others, it is brought about by some definite condition which produces nervousness. This type of diarrhea is often a symptom of neurasthenia or hysteria. There is probably an over-secretion from the intestinal mucosa, due to a hypersensitive nervous system. This diarrhea is characterized by several watery

movements which occur suddenly under excitement or fatigue, and as quickly stops after the removal of the cause.

Eliminative Diarrhea is the term given to a type of diarrhea which cannot be classified with the intestinal diseases nor with those due to nervous influences. Its exact etiology is not clearly understood, but it is recognized as distinctive when accompanying uremia and some of the acute infectious diseases. It seems to be due to the toxins produced in the system as a result of the primary disease. The diagnosis must be made by considering the complicating disease, particularly its severity, and then arriving at a possible solution by elimination of other causes.

Fat Diarrhea is simply a form, or evidence, of weak, fatdigesting powers. It is indicated by the presence of large amounts of undigested fat in the stools.

Vomiting with Obstinate Constipation, when occurring within the first forty-eight hours, would indicate the presence of an intestinal obstruction due to a malformation of the rectum, anus or colon. Congenital deformities may occur at any point in the intestinal canal, but are most common in the rectum. Vomiting at this early period of life may also be due to a specific duodenal ulcer.

Rectal Pain may vary from a slight discomfort to the most intense suffering, and may be constant or periodic. It may be described as covering a large portion of the rectal region, either externally or internally, suggesting the involvement of some adjacent organ. The pain from fissure and abscess, in almost every instance, excites the spasmodic contraction of the spincter muscles and originates a train of symptoms greatly out of proportion to the gravity of the disease.

The lancinating, dull, throbbing, or heavy pain accompanying an acute catarrhal proctitis is so characteristic of that affection that a diagnosis is easily suggested.

The pain of fecal impaction, due to an obstruction, is usually referred to the sacral region higher up than the ordinary affections and is nearly always of a dull, aching character, constant whether the patient is walking about or lying down.

Pain is much more severe at the muco-cutaneous junction, and progressively becomes less pronounced in affections higher up in the rectum. The patient will complain more from the presence of a fissure at the anal orifice than from the ravage and destruction of a malignant growth higher up in the rectum. The excruciating pain causing tenesmus points to some affection of the anal ring, while the dull, constant boring, aching, pain indicates the involvement of the rectum. Pain coming on immediately after stool is almost a positive sign of the presence of a fissure from the stretching or bruising of the ulcerated surface by the fecal mass. When due to an extensive ulceration, blood and pus are often present in the discharge, and the patient is likely to have fever and looseness of the bowels.

Pain in the back portion of the abdomen and pain affecting the sciatic nerve of the left side is always suggestive of an infiltration from a long-standing rectal growth into the adjacent tissue.

Hemorrhage. Bleeding from the rectum is a very frequent symptom of rectal diseases. It may be slight, coming directly from a protruding hemorrhoid or the ulcerated surface of a fissure, while in other instances it will be profuse and dangerous to the life of the patient. Profuse hemorrhage seldom occurs with diseased conditions, and when post-operative is almost exclusively the accompaniment of the surgical treatment.

Blood-streaked mucus or fecal matter indicates a catarrhal condition, malignant growth, polypi or adenomata, higher up in the alimentary canal while the sudden spurt or steady stream of blood after coughing, sneezing or straining usually indicates an abrasion or rupture of the arterial or venous plexus in or above the anal canal. Typhoid fever, yellow fever and malaria, anemia, purpura, scorbutus and heart diseases may be accompanied with loss of blood from the rectum. Blood from the stomach or small intestine is incorporated with the digestive residue, while blood from the lower portion of the alimentary canal is often expelled, independent of the fecal

mass, in the form of slight or severe hemorrhage.   Bleeding in the majority of cases may be associated with internal hemorrhoids, and is probably next frequent with fissure in ano.

Protrusion ordinarily indicates the presence of hemorrhoids, but it may be caused by a polypus, malignant growth, prolapse or a foreign body.   Ordinarily protrusion does not take place in any of these diseased conditions without straining, or a prolapse of the adjacent organs, and may be regarded as a symptom of little value which only affords the visual aspect and a convenience in making a digital examination.

Inflammation with or without the formation of pus may be a symptom of infection, or injury to the rectal mucous membrane or the peri-rectal tissue.   It may be secondary to some irritant swallowed with food, as a fish bone, which might later lodge in the rectum.   The passage of hard feces, the ingestion of irritating purgatives or the use of frequent enemata may inflame the mucous membrane and cause acute catarrhal proctitis.   Kicks, blows, ulcerations and surgical operations in this region may result in infection and abscess formation.

Auto-Intoxication is an almost constant symptom of all the chronic intestinal diseases and constipation.   Bacteria or their toxines are either absorbed through the diseased mucous membrane or they enter through the blood vessels.   Their mode of entrance and the effect upon the nervous system is not well understood.

Discharge of Blood, pus or mucus from the rectum should always suggest an examination.   The finger or the proctoscope may be used.   Blood may be due to fissure, hemorrhoids, polypi, cancer or ulceration.   Pus suggests broken down tissue from ulceration, due to malignant or non-malignant growths, colitis, abscess, fistulæ, or fissure.   The odor of blood-stained malignant disease discharges is characteristic of the disease.   Mucus may indicate chronic atrophic or hypertrophic colitis, sigmoiditis or proctitis.

Altered Stools. When the normal form and color is changed there may be stricture, from many causes, producing the hard, narrow, tape-like stool, with symptoms of fecal im-

paction. Fluid stools indicate irritation and quickened peristalsis from a number of colonic affections.

Frequent and Painful Urination is often due to fissure in ano, particularly when located in the anterior median commissure. Fissure in ano is commonly overlooked in children as a cause of these symptoms. Rectal disease located low down usually cause reflex irritation of the bladder.

CHAPTER VI

MALFORMATIONS

Embryology and Histology teach us that the rectum is a development of the hypoblast and mesoblast, in connection with the rest of the colon. Further, we learn that the rectal mucous membrane is formed from the hypoblast; the submucous layer and muscles from the inner layer of the mesoblast, and that the rectum proper ends with the free border of the semi-lunar valves or serrated margin of the pecten.

Also we learn from embryology that the rectum and anus are the development of two distinct layers of the blastoderm; that the blood supply is different and independent, comes from different sources and returns by different routes to the general circulation. Should there be an arrestment in the development of one, there is not necessarily an arrestment in the other. In other words, a malformation in the anus does not mean a malformation of the rectum. Malformations of either one of these organs, however, are likely to be associated with deformities of the same histogenic origin. Children with malformations of the rectum are very apt to have a cleft-palate or other deformities of the intestinal canal. Malformations of the anus may be associated with deformities of the uro-genital organs, the bladder or the vagina. It will be seen then that malformations of the rectum and anus may be accompanied by deformities in any of the pelvic organs, or of the bony structure, dependent upon the embryologic formations.

The enumeration of these malformations, as given to us in 1781 by Pappendorf, seems to have stood the test of time for convenience of classification, and, but for the theory of embryologic formation, would suffice for all purposes to this day. Therefore a rearrangement to conform with this theory,

as given by Tuttle, dividing them into those of epiblastic, meso-blastic, and hypoblastic origin will be accepted here.

ANUS

1. Partial occlusion.
2. Abnormal narrowing.
3. Anal opening at some abnormal point, such as the perineum, scrotum or sacrum.
4. Complete occlusion.
5. Entire absence of anus.

RECTUM

1. Rectum opening into some other viscus.
2. Normal rectum and anus but some other viscus opening into the rectum.
3. Rectum arrested in its descent.
4. Rectum absent (including entire colon sometimes).

In treating the subject of malformation, two divisions will be made for convenience of description: those presenting the symptoms of *partial obstruction,* and those which cause *complete intestinal obstruction.*

PARTIAL OBSTRUCTION

In this classification, the malformations vary from the mild degree of partial occlusion to that of the rectum opening into some other organ allowing more or less fecal matter to escape from the bowel. They present conditions, in most instances, not immediately dangerous to the life of the child. The malformations may be:

1. Partial occlusion.
2. Abnormal narrowing.
3. Anal opening at some other abnormal point.
4. Rectum opening into some other viscus.
5. Normal rectum and anus but some other viscus opening into the rectum.

Partial Membranous Occlusion of the Anus. The occlusion occurs at different levels of the anal canal, and consists of a membrane or fold of tissue. If the membrane is located at the margin of the anus, it may be composed of skin. When extending from the sacrum to the coccyx, it may represent the central raphe in the form of a narrow, cord-like extension with an opening on each side over the anal canal, allowing the escape of meconium. When the occlusion is higher up, the membrane will be composed of muco-cutaneous tissue, of crescentic or circular shape, partially obstructing the anal canal. The histologic origin of this occlusion is not known, but seems to be due to an imperfect absorption of embryologic tissue. When the occlusion is higher up, it is probably due to a fault in the absorption of the ano-rectal partition during fœtal life.

This condition is sometimes seen in adult life, when the occlusion happens to be of mild degree and is unnoticed.

Treatment. In cases of Partial Occlusion by a membranous band immediate removal of the obstruction with a knife or scissors should be done; subsequent dilatation may be necessary with the finger.

Abnormal Narrowing of the Anus. This condition may take place at any point in the anal canal, from the external margin to its junction with the rectum, and may extend throughout the whole length of the canal. These cases, to the casual observer, usually present the appearance of a normal anus, and are commonly overlooked until adult life, when the anal canal is found to be narrowed at some portion. The narrowing may be caused by bands of tissue or membrane extending across the sides of the canal, or it may extend the full length of the canal, causing a shortening in its length or breadth.

The size of the normal anal canal at birth is dependent upon the size of the child. For the purpose of diagnosis, the anal canal of the average child at birth should be large enough to admit with ease the index finger of a woman or the little finger of a man's hand. When the sphincters are

properly developed, they will gently grasp the introduced finger, but when the narrowing is abnormal, this sphincteric action will not be observed, and it will be found difficult or impossible to introduce the finger further into the canal. Children suffering from this condition are generally supposed to be constipated, as the narrowing of the anal canal interferes with the proper escape of fecal matter. As the child gets older and the fecal matter becomes less fluid, the narrowing causes obstruction and irritation, forcing the patient to strain and suffer considerable pain whenever the bowels are moved. A marked constipation, due to the fear of pain at stool, soon appears, with all its evil effects.

Treatment. An abnormal narrowing of the anus should be dilated with the soft rubber bougie every day, until the aperture is large enough to admit the small finger of the operator.

Anal Opening at Some Abnormal Point. *Treatment.* If the abnormal opening is situated near the normal site of the anus, the rectum should be dissected out, carried down and sewed in its proper position. When the anal opening is too far removed to carry out this plan of treatment, the abnormal opening should be closed and the rectal pouch dissected out and brought down to the normal site. The abnormal opening will gradually close itself, if the surface is stimulated with nitrate of silver. If the opening fails to close within a reasonable time under this form of treatment, it may be dissected out, and an attempt made at primary union. These cases do not as a rule require immediate treatment, if one will watch for symptoms of intestinal obstruction or infection.

Rectum Opening into Some Other Viscus. This malformation comprises fifty per cent. of all rectal malformations. The greater number consists of the recto-vaginal type. Its various types are found in both males and females, as designated by the organ with which the rectum communicates, and as will be seen in the following forms. *Atresia Ani Vesicales* is that form in which the rectum opens into the bladder, and *Atresia Ani Urethralis* is that in which the rectum communi-

cates with the urethra. *Atresia Ani Vaginalis* is a very common form in which the rectum opens into the vagina. *Atresia Ani Uterinæ* is where the rectum opens into the uterine cavity.

Atresia Ani Vesicalis. This deformity occurs in both sexes, but is most frequent in male subjects. The opening is likely to be situated on the trigone, or up a little higher in the fundus of the bladder. It sometimes occurs very low between the orifice of the ureters, and there is then an anal canal which runs obliquely through the walls of the bladder, which allows only a small outlet for the contents of the rectum. When the opening is higher up in the fundus of the bladder there is a freer exit for the fecal matter. The diagnosis in these cases is sometimes very difficult, while in others the absence of any fecal matter will suggest an examination. The appearance of the greenish stain from meconium in the urine is a guide to the trouble. Should there be a large amount of meconium in the urine, these cases need prompt treatment in order to turn away from the bladder the contents of the bowels, as otherwise an infectious cystitis will result, with involvement of the ureters and kidneys. If on the other hand the opening is very small, not allowing the escape of the proper amount of intestinal contents, the child will die from obstruction of the intestine. In either case the prognosis is bad. The operative procedure to alter the condition is usually so severe that the child is unable to stand the shock, and death results.

Treatment. When the rectum opens into the bladder immediate operation is necessary to save life, as infection occurs very early. An abdominal incision is required to search for a communication between the rectum and bladder. The channel of communication may be invaginated into each organ after section and suture, but provision must first be made by means of proctoplasty, for the normal escape of fecal matter at the proper site. When it is not feasible to draw the rectum far enough down to permit proctoplasty, a colotomy should be done at the site of the abdominal incision, or to either side, according to the judgment of the operator.

Atresia Ani Urethralis. This malformation occurs in the male and female, and while it is less frequent in its occurrence than some of the other forms it happens with a certain amount of regularity, appearing much more frequently in the male. - The rectal pouch is always lower down and nearer to the normal site than the other malformations of this group, and therefore very much more favorable for operation and not so dangerous to life, if left until the child is in good condition for surgical aid. The opening may be at any portion of the urethral tract, but is generally situated in the membranous portion of the male urethra. The diagnosis is generally much simpler than when the malformation opens into the bladder, as the meconium, or the fecal matter, is constantly voided independent of the urinary discharges. If the opening between the rectum and urethra be very small, danger of intestinal obstruction becomes apparent, and either dilatation or incision becomes an immediate necessity.

Treatment. The condition is more favorable for operation in this malformation, as the rectal pouch is always lower and nearer to the pelvic floor. The abnormal channel in these cases may be utilized to bring down and stitch at the site of the normal anus. If the abnormal channel is enlarged and divided at the lower end of the rim, a portion of it may be sewed into the proposed anal opening, then the opening in the urethra will close without further treatment.

Atresia Ani Vaginalis. This variety is the most frequent of all the malformations of the rectum. This disease is very frequently overlooked until adult life as it often produces so little subjective disturbances that it goes unnoticed. Numerous observers have had the experience of discovering this condition when examining for other diseased conditions or at the time of accouchment. The opening may be at any portion of the vaginal tract or between the anus and vaginal openings. The communication varies in size from a very small to a very large opening. The opening seems to be supplied with a sphincteric muscle, probably analogous to the normal

sphincter and composed of normal hypertrophied circular fibers of the rectum.

Treatment. If the abnormal opening into the vagina be too small, it may be dilated sufficiently to admit the passage of fecal matter and left until the child is old enough to bear

Fig. 11. Atresia ani vaginalis.

the operation safely, generally considered from three to five years. Authorities agree that it is unadvisable to permit such malformation to exist to the age of puberty or adult life. The diagnosis is generally made from the bulging meconium against the occluding membrane or hymen, and dilatation suf-

ficient to allow free movement of the bowel should be the first treatment of these cases, and be continued as long as found necessary.

The operation of Rizzoli recognizes the sphincteric action at the vaginal anus and takes the tissue as a whole and aims to preserve it after removal to the normal anal site. His operation is as follows: An incision is made from the posterior margin of the vagina to the site at which the normal anus should have been. A careful diagnosis is then made to reach the rectal pouch which is loosened from its attachments, the vaginal anus is then dissected out and dragged down to the normal position of the anus. The vagina and perineum previously cut through are then sutured together with either catgut sutures or deep silver sutures and the mucous membrane is restored, which then completes the recto-vaginal septum. In cases where there have been two openings into the vagina, a plastic operation is necessary which will require great ingenuity in order to accomplish good results. When two openings exist, single incisions which convert the two into one opening, the margin surrounded by a purse string suture, and sewed into the normal side of the anus, will often prove successful. When the openings are widely separated it is a better plan to use the lower opening for the new anal canal and close the upper opening by inversion with Lembert sutures.

Atresia Ani Uterinæ. This communication is probably of the rarest variety. The malformation is so infrequent that little is known of it and no definite plan of treatment has been laid out. The life of the child should be the first consideration, which would dictate either a colostomy, or, if possible, the establishment of the anus at the normal site.

Normal Anus with Some Other Viscus Opening into the Rectum. When the uterus or vagina opens into the rectum the course of treatment described for Atresia Ani Vaginalis would apply. When the ureters empty into the rectum, the bladder is absent and are beyond surgical aid, eventually leading to infection and death from kidney abscess.

COMPLETE INTESTINAL OBSTRUCTION

These malformations are of four different types:

1. Complete occlusion of the anus.
2. Entire absence of the anus.
3. Rectum arrested in its descent.
4. The entire absence of the rectum.

Complete Occlusion of the Anus. The difference between the complete occlusion and the partial occlusion of the anus by a membrane or diaphragm is one of degree only. The partial occlusion may not be in any way dangerous to life, but when this band is composed of fibrous or muco-cutaneous tissues thick enough to cause total occlusion, the child's life must be saved by the immediate relief from the obstruction. Partial occlusion occurs more often than statistics show, as the physician in attendance usually provides a free exit for the meconium as soon as the malformation is observed.

When the rectum has properly developed, the meconium can be easily seen pressing against the thin and transparent membrane. The question as to whether this malformation results from an arrest in the absorption of the membrane dividing the rectum and anus during its embryologic formation, or during the development of the rectum from the hypoblast and mesoblast, is still one of doubt. In some cases the membrane bridges over the skin, and in others is located high up in the anal canal, at or at about the pecten, which would suggest that it is due to an arrest in absorption, but does not explain why it occurs in the lower position. Therefore, we have either a malformation, or unabsorbed tissue resulting in a deformity.

Simultaneous with the development of the rectum, there is an invagination or turning in of the ectoderm, epiblast or serous layer which persists until absorbed. The proctoderm of the epiblast and the hypoblast (entoderm or mucous layer) approach each other forming a double septum between the rectum and anus. The absorption of this membrane completes the anal and alimentary canal.

The absence of the natural discharge of meconium will be the first symptom observed, the bulging, discoloration of the membrane, and the inability to introduce the finger into the rectum will corroborate the diagnosis.

Treatment. A complete occlusion by a membranous band

Fig. 12. Membranous occlusion of the anus.

is best treated by a crucial incision and subsequent dilatation with the finger as suggested for the abnormal narrowing. Care should be exercised that the cicatrix resulting from cutting the membranous band does not contract.

Entire Absence of the Anus. This malformation is comparatively rare, *per se.* As a rule it presents only a slight de-

pression in the skin, where the normal anus should be; or there may be a slight elevation of skin or a protrusion at this part. The most pronounced observation in some cases will be that the raphe in the perineum may extend all the way from the scrotum to the coccyx. In some cases there may be a slight discoloration over a partly formed anal ring.

Fig. 13.   Entire absence of the anus.

These cases may present almost the same symptoms as the undescended rectum, when the rectum reaches close to the skin. There may be an undescended rectum, a malformation of hypoblastic origin, or an absence of the anus of epiblastic origin. In those cases in which there is simply an absence

of the anus, we would expect to find the rectum normal in its descent to the pecten, and surgical procedure would not be so dangerous; whereas the other condition—the undescended rectum—would necessitate one of the severest surgical procedures in this region.
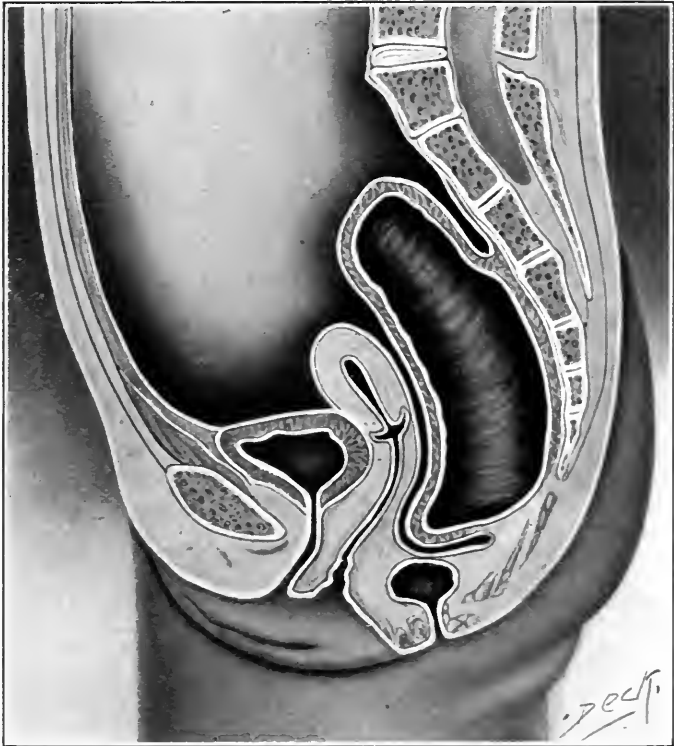
Fig. 14. Malformation in which the peritoneum extends between blind end of the rectum and the normal anus.

Rectum Arrested in its Descent. In this form of malformation the rectum is either arrested in its development and fails to reach the anal opening, or it may descend in the wrong direction and fail to reach the anal canal. The rectum may be arrested at a variable distance from the anus, sometimes only within so short a distance as to suggest the com-

plete occlusion by a membranous band, while in others several inches may intervene. There may be obstructions at several points due to adhesions above the undescended rectum. The diagnosis in these cases is usually made a few days after birth by the mother or the attendant calling attention to the absence of bowel movement. When a normal anal canal exists a malformation is not suggested by digital examination until the absence of the discharge of meconium is noted and fecal vomiting with abdominal distention occurs. When the rectum is low down and close to the anal canal impulses can be readily felt with the finger. If the rectum is at some distance higher up, or has descended in front or back of its normal course, such impulses will not be felt. It is impossible to tell with any degree of accuracy by any known method the exact location at which one may find the rectum, and the only method is by dissection, which should be done at once when the condition is recognized. The introduction of a trocar or an aspirating needle for diagnosis in these cases is extremely dangerous, as the peritoneum may dip down between the rectum and anus, and the needle would then pass through the pouch of Douglas to reach the undescended rectum.

Entire Absence of the Rectum. This deformity is one which is impossible to diagnosticate without operation. It resembles the severer type of the undescended rectum, and it is impossible to differentiate one from the other without exploratory incision.

In this variety there may be entire absence of the colon, and the rectum. In some cases, where the large bowel is entirely absent, the small intestine may open at some abnormal site, the neck, or the umbilicus.

Treatment. These cases belong properly under the classification of intestinal obstruction, and are in imperative need of an exit for the intestinal contents within a short period after birth. They must be considered from the standpoint that should the child live, the operative procedures have instituted a normal or artificial exit for the intestinal contents which will serve the purpose of a normal physiological organ.

An effort should be made to have the anal outlet at the proper site and surrounded by normal tissue. If possible, operation at the time of necessity should not be so extensive as to jeopardize the life of the child. The quickness or facility with which one operates without an anesthetic lessens the
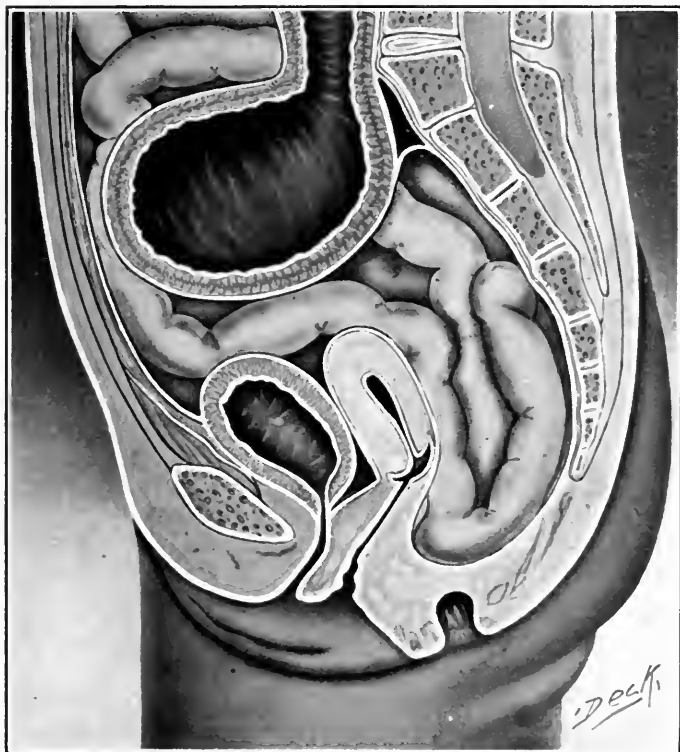
Fig. 15. Entire absence of the rectum. The colon ending in dilated pouch.

amount of shock, and improves the chances of recovery. One should, if possible, adopt those surgical procedures which will enable him to see, or feel the tissue of the neighboring organs. In cases where the anus is absent the sphincters are generally absent also.

The entire absence of the rectum is infrequent as compared

to the other malformations of this region. The rectum arrested in its descent is with difficulty differentiated from the entire absence of the rectum; it may be impossible without a posterior proctotomy, Kraskes' or Vincent's incision for finding the rectum. Should the skin, over the proper site of the anus, be tinged with the dark greenish color of the meconium it is reasonable to presume that the rectum is just beneath it. There should also be a bulging of the surface and palpation reveals the fluid contents. The introduction of the trocar for the purpose of discovering the rectal contents is not to be recommended as the pouch of Douglas sometimes descends beneath the lower end of an undescended rectum, the trocar would be passed through the peritoneum, and into the rectum causing subsequently peritonitis from infection, if the child has been fed. The operation for the diagnosis of either of these conditions is as follows:

A straight incision is made at the normal position of the anterior margin of the anus, which should extend upward and backward, to the top of the coccyx. If there be a rudimentary anus, the incision should begin at the posterior margin. Should this fail to reveal the rectum, the dissection should be carried upward and backward into the hollow of the sacrum, so as to avoid wounding the pelvic organs. The rectum should be loosened from its attachments and brought out through the wound before being opened. If the rectum is greatly distended, or there is a shortened mesco-rectum, and the pouch cannot be pulled down, the introduction of a trocar to draw off its contents will generally allow the rectum to be drawn down low enough to attach the mucous membrance to the margin. The serous and muscular coats may be allowed to retract. If it is impossible to draw the rectal pouch down low enough to attach its mucous membrane to the normal anal margin, it may be attached to the nearest point it will reach without too much tension, making either a perineal, sacral, or abdominal anus. After sewing the mucous membrane in position, to protect against infection the posterior part of the perineal wound should be closed with sutures,

taking the precaution to leave in a small drain for a few days.

Rectal surgery for the relief of malformations necessitates a knowledge of the various methods of attaining access to this organ by quick, decisive means, not often feasible in the adult. The softness of the bony structure is greatly in favor of rapid work on these subjects and leave few chances for accomplishing the purpose in other directions. Some form or modification of the Kraske operation is therefore the only procedure that can meet the demands of an undescended rectum when space is necessary to accomplish the task.

The Vincent operation takes advantage of the soft, cartilaginous bones at this period. The coccyx and lower part of the sacrum are split through the center with a pair of large scissors, which allows sufficient space for operating after the wound is retracted. It also permits a good view of the interior of the pelvic cavity. When the rectum has been found and brought to its normal position, the pelvic frame is brought together with deep sutures.

The Vincent operation is much more satisfactory than the Rydygier or original Kraske, when the rectum is not too high up to require more space for its manipulation and when it can be drawn down low enough to attach it at the normal anal site. When this is not possible, the Kraske operation, or one of its modifications, may be employed. The Vincent operation will permit the excision of a section of the sacrum for the purpose of making a sacral outlet in an emergency.

Kraske's original method of reaching the rectum by cutting off a portion of the lower end of the sacrum has been modified and described by many surgeons, each having a particular object in view which includes the removal of the coccyx and various parts of the sacrum. Others are intended as flaps to be restored to their former position.

Kraske excised the coccyx and the lower left angle of the sacrum, (Fig. A). Hochenegg modifies this operation by removing the lower end of the bone by an oblique section which extends from the third sacral foramen on the left to

the notch below the fourth foramen on the right, (Fig. B.) Rydygier makes an oblique incision through the soft
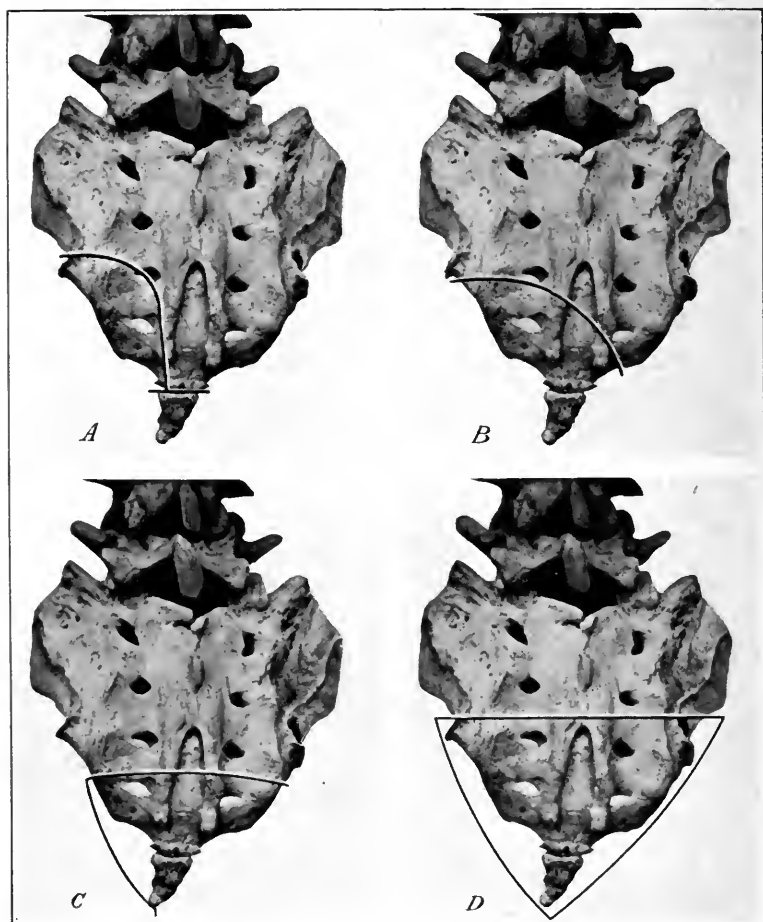
Fig. 16. Methods of sacral resection for locating the rectum. A, Kraske's; B, Hachenegg's; C. Rydygier's; D, Hegar's.

parts on the left side of the sacrum from the posterior superior spine of the ilium to the tip of the coccyx and then carries the incision in the median line down to the anus. A

tranverse incision is then made on a level with the third sacral foramen and the bone is then chiseled through so as to permit the raising of the flap of bone and tissue, which exposes the posterior rectal wall for extirpation, (Fig. C). Hegar practically carries the incision down to the coccyx on both sides, splitting the sacrum at the third sacral foramen (Fig. D), the bone flap is turned upward and replaced after the rectum has been resected.

The modifications of the operation originally performed for the sacral exposure of the rectum are so numerous that a description could hardly serve a purpose beyond showing that each surgeon adopts a plan of his own to meet the emergency during the technique employed by himself. The operations of Kocher, Jaennel, Rehn, Heincke, Bardenhener, Levy, Roux, Walker, Borelius are only a few of the many ideas expressed in the form of operative measures in general use for the exposure and extirpation of the rectum.

CATARRHAL DISEASES OF THE RECTUM AND COLON

It might be well to say, in advance of the consideration of the simple catarrhal and specific inflammations of the colon and rectum, that those enumerated under this heading are accepted from the text of other authors as the simplest classi- fication. The nomenclature used by pathologists and intern- ists varies greatly, either as to names or classifications, and it is often very confusing to the student. So the reader must of necessity endeavor to understand these diseases when described by other writers under somewhat different titles.

Again it seems that surgeons who premeditate operations for the relief of the severe colonic affections should make themselves familiar with these different pathological conditions so that they may be able to make a diagnosis similar to the internist, then to decide as to which is the better way to treat a particular case. Often these cases have passed beyond re- lief from surgical treatment and die from shock when oper- ated, as the result of their great debility. They are some- times treated more successfully without operation for a cer- tain period until a better physiological balance is attained.

To facilitate the formation of a mental picture of the simple catarrhal and specific diseases of the colon, sigmoid and rec- tum, the following diagramatic scheme is submitted:

SIMPLE CATARRHAL AND SPECIFIC INFLAMMATIONS OF THE RECTUM AND COLON

Simple {Acute
Atrophic
Hypertrophic................{Mucous Colitis
Membranous Colitis
Chronic Colitis
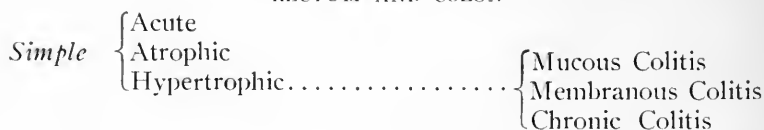
Specific {
Tubercular
Dysenteric.................... {
Amebic
Bacillary
Catarrhal
Mixed
}
Syphilitic
Gonorrhoeal
Erysipelatous
Diphtheritic
}

Ulcerative colitis
Secondary membranous colitis
Follicular colitis

The catarrhal diseases of the large intestine classified as colitis, those described as sigmoiditis, and lastly those attacking the lower five or six inches of the alimentary canal, known as proctitis, are pathologically the same diseases only situated at different portions of the large bowel.

The first step to a practical understanding as to the etiology, diagnosis, and treatment must be the ability to reason the cause and effect of either of these forms of disease at any level of this tract. The cause may be the same in either a colitis, sigmoiditis, or a proctitis in many instances, but just why a particular area is selected cannot be explained, unless there is a known physiological or anatomical weakness. We may have all the alimentary canal affected by the same inflammatory process at one time. Experience with the simple catarrhal inflammations show a tendency to extend downward while an extension upward seldom or never occurs.

When the disease has been a general inflammation of the entire colon and resolves itself into a chronic catarrhal condition of either of these three portions of the bowel, it is hardly possible to decide as to the exact area affected in the original or primary inflammation.

The catarrhal inflammations of the rectum find their analogues in those of the pharynx, and the comparison makes them easily recognized by the general practitioner with average experience.

Many of the pathological conditions which affect the adult

intestinal canal are to be found in those of the child. If we could conceive of a general working scheme or classification based upon our more intelligent knowledge of local conditions in the adult, perhaps more could be accomplished with the treatment of these diseases when they occur in children and infants.

SIMPLE CATARRHAL COLITIS AND PROCTITIS

Proctitis, or inflammation of the rectum is a common disease in the adult and child, associated with a colitis. The onset of an intestinal catarrh may not be definitely confined to any portion of the tract, but later resolve itself into a colitis, sigmoiditis, or proctitis. Beginning with the same cause in the adult, a sigmoiditis and a proctitis are very commonly associated. The vulnerability of the child to either of these diseases seems even greater than the adult, when we consider the frequency of intestinal troubles in children.

The common form of proctitis is a simple catarrhal inflammation of the lower end of the intestinal canal, divided into the acute, atrophic, and hypertrophic.

Acute Catarrhal Proctitis follows the well-known course of catarrhal inflammations, and is dependent upon idiosyncrasies, habits, environments, hereditary influences, etc. The disease may begin in the rectum, or from any portion of the bowel above, and therefore brings with it very frequently the treatment of all the intestinal canal.

The use of the proctoscope has revealed this disease to our eyes, in either the adult or child.

Symptoms. Acute catarrhal proctitis is a sudden inflammatory process, varying in degree as to severity and cause. It is sometimes accompanied by a chill and rise in temperature at the onset, with a coated tongue, headache, a feeling of fullness, heat and weight in the rectum, tenesmus, bearing down and a desire to micturate. This condition causes the sufferer to imagine there is a foreign body in the rectum, and he tries to dislodge it by frequent attempts at stool. The mucous membrane becomes swollen, and the caliber of the

rectum thereby decreased. The patient seeks the recumbent position rather than walking about. At first, there is a discharge of the fecal fluid; later this becomes bloody, mixed with mucus. If the inflammation continues uncontrolled, ulceration and sloughing may follow. When this occurs, pus will be added.

These attacks may only run the ordinary course of a catarrhal inflammation and subside within seven or eight days, or may become chronic, with an indefinite period of invalidism.

Etiology. Intestinal parasites, foreign bodies, impacted feces, exposure to cold, prolapse of the rectum, drugs,—such as arsenic or corrosive sublimate, and intussusception are common causes. Rheumatism is probably a factor in its causation. Attacks of acute indigestion are very often associated with acute proctitis in a mild form. Polypi, adenomata, villous growths, papilloma and various other new growths may be present, and acute catarrhal inflammations may appear as periodic exacerbations, particularly in the rectum and sigmoid.

Treatment. Treatment must be directed to the cause or source of irritation. When due to intestinal infection or putrefaction the bowels should be evacuated at once by saline cathartics or lavage. Insist upon absolute rest in bed, in the horizontal position, which is in fact the best place. Abdominal massage is contraindicated in these cases, although of value in ordinary constipation. Every day for a period of two weeks give injections of cold or warm water into the rectum with the double current rectal irrigator, for ten or fifteen minutes. The temperature of the water should be that most agreeable to the patient. Instead of water a solution of either of the following will be found more useful: five per cent. (5%) witch-hazel, or twenty per cent. (20%) aqueous fluid extract krameria. The use of either krameria or witch-hazel has given me the best results. The irrigating fluid returns as fast as it enters, and therefore is not dangerous. After the irrigation the rectum should be drained out through the

irrigator. Flaxseed tea, with opium and krameria, is sometimes very effective in relieving the tenesmus.

The Diet should afford the patient food of nourishing character, non-irritating and easily digested. Restrict the diet to thin gruels, broths,—such as beef, mutton, or chicken, or some of the prepared foods, as peptonoids or Mellin's. These are preferable to the milk diet in order to avoid constipation and irritation of the senstitive mucous membrane by any undigested débris or hard fecal matter.

Should the inflammatory condition have produced ulceration, the irrigation must be continued for a period long enough to ensure perfect healing. In addition some antiseptic powder, such as bismuth, should be insufflated through a tubular speculum, with the patient in the knee-chest position.

After the acute symptoms have subsided in cases due to chronic constipation, and the intestine has been thoroughly emptied, the treatment should be to prevent recurrences due to fresh accumulations. An endeavor should also be made to prevent the bacterial growth by the administration of some non-irritating intestinal antiseptic by mouth.

The Prognosis is ordinarily very good in these cases, particularly when the patient has sufficient mental stability to persist in the treatment and diet for a sufficient time after the attacks to thoroughly control the digestive disturbance. The ordinary articles of diet which are indigestible to these patients are in general as follows: green vegetables, raw fruit, game, crabs, lobster, crayfish or any variety of crustacean, hashes, rich gravies, stews, pastry, alcohol, fats, and pork (lean bacon sometimes excepted).

Atrophic Catarrhal Inflammation of the colon, and rectum is characterized by its thinned-out, almost transparent mucous membrane, the membrane being so much denuded of its glandular elements as in some cases to make plainly visible the underlying net-work of veins and arteries, with an occasional area left bare that from the denudation of the epithelium, resembles a small ulcer. This condition is the result of a long continued chronic atrophic inflammatory process. It

may begin in young adult life in the form of a hypertrophic inflammation and continue to old age. The mucous membrane looks granular, with portions more or less congested and bossellated. The air pressure will be sufficient to balloon the whole cavity to such an extent as to almost burst the bowel, and so distort it as to make the passage of the sigmoidoscope much more difficult than with the hypertrophic variety, which, being heavier, holds the contour so much better and assists in finding the course of the bowel lumen. The surface is dry, maybe rough, or glistening smooth, inelastic, and, as mentioned, very light in weight. The crypts of Lieberkuhn are greatly bared of their epithelial lining, excepting at the bottom.

Etiology. The influences said to cause this disease, or relate to it, are so many that it is a question as to our having any satisfactory idea of its true origin. In my practice I have always considered the nearest and most practical way was to regard the cause of this atrophic catarrhal condition as one of syphilitic origin, either inherited or acquired, or the result of the degeneration of a hypertrophic inflammation. Some constitutional weaknesses seem almost certainly to be a cause. Environment, overwork, poor health, poor ventilation, improper feeding, either over-eating or poorly selected diet of childhood are other causes. This disease and its complications collectively form a large percentage of the cases of catarrhal conditions which the rectal specialist is called upon to treat, bringing it to the foremost rank of importance, and requiring the greatest circumspection to find the cause.

Symptoms. Constipation is naturally the first cause of complaint, as the weakened tissue wall and the loss of the physiological mucous secretion would suggest. The stool is dry, hard and lumpy, sometimes coated with mucus or blood. The atrophy extends to the anal margin, in some cases causing numerous small fissures and hemorrhoids. Flatulence and indigestion are almost constant symptoms. The patient feels languid, complains of loss of sleep, loses flesh, and suffers from general nervous disturbances, making him fear a gen-

eral breaking down in health, as the nature or extent of the trouble is not understood.

Treatment. First, the constitutional treatment, directed to the probable underlying cause. For a routine treatment the syrup ferri iodide, the suggestion of an open air life, the use of plain digestible foods, and the regulation of the bowels so as to make the bowel empty the entire lower contents at one, or at the most two, movements each day. The stimulation of intestinal peristalsis with cascara seems to be the ideal method. Sugars and starches should be used with moderation, on account of their tendency to fermentation. Tea, coffee, and alcohol are to be discouraged and if possible not used. The local treatment must first be to relieve the distressing symptoms about the anal margin, such as pruritis, fissures, or hemorrhoids. Nitrate of silver, in one form or another, stands almost invariably in the foremost rank, with all authorities, for the treatment of fissures. My experience has been that nitrate of silver is the best. The pruritis is very often present with the fissures or hemorrhoids, and can best be relieved by controlling the mucous discharge from the rectum or sigmoid.

Atrophic proctitis or sigmoiditis should be treated on the theory of a mal-nutrition, and methods which cause a reasonable degree of congestion in the parts are indicated. The irrigation of the rectum and sigmoid, if possible, for fifteen or twenty minutes each day with simple hot water or one to two thousandths solution of silver nitrate will be most useful; or five to ten per cent. ichthyol solution. The application of nitrate of silver or ichthyol is best after the bowel has been cleansed by the plain water. Sometimes the fluid extract of krameria in twenty per cent. solution will be most beneficial in soothing the irritated mucus membrane until the more stimulating treatment can be instituted, which can be determined by the amount of tenesmus or pain after the injection with the nitrate of silver. A one-half per cent. solution may be applied with the proctoscope or sigmoidoscope and by the use of an ordinary hand ball atomizer the desired solu-

tion is thrown into the bowel. The window of the procto-
scope is then put on and with the air insufflator the fluid is
blown upward. Several applications may be necessary be-
fore the entire area is thoroughly treated. Care should be
exercised on the withdrawal of the proctoscope that the win-
dow is left on so that the air already in the bowel will not
force the solution out on the withdrawal of the instrument.
This can be avoided by the prompt application of a gauze
sponge, and the quick withdrawal of the proctoscope.

**Chronic Hypertrophic Catarrhal Colitis (Chronic Colitis,
Mucous Colitis, Membranous Colitis).** All of these names are
used to describe the hypertrophic form of catarrhal colitis,
which consists of a hypertrophy of the glandular and sub-
mucous elements. The mucous glands and follicles (Lieber-
kühn) are distended with mucous. The epithelial cells un-
dergo fatty degeneration. The lumen of the gut may be nar-
rowed, caused by the over-production of tissue and swollen
glandular apparatus.

Ordinarily, the gut wall remains the same, or slightly thick-
ened. There may be small abrasions or excoriations due to
the ease with which the membrane is injured from the feces,
or on the introduction of the sigmoidoscope. Ulceration is .
found in the severer forms. The membrane presents the ap-
pearance noted in the pharynx with the same form of catarrh ;
inflamed and swollen, with occasional bleeding points. The
pain prior to the expulsion of the mucus, technically called
the mucous crisis, is probably caused by the intestinal peristalsis
bruising the swollen and inflamed mucous membrane.

This disease probably begins during infant life, from poorly
selected diet in some cases, and continues unabated to old age.
It is probably the forerunner of the atrophic type in which it
terminates. The relation of these diseases to hemorrhoids
will be discussed in that chapter.

Symptoms. Pain at defecation, with the discharge of
mucus and possibly blood, associated with chronic intestinal
indigestion and the discomforts produced by it, such as flatu-
lence, loss of appetite, lassitude and mental depression, are

the subjective symptoms which alarm the patient and lead him to seek the advice of the physician. Constipation may alternate with diarrhea; the hard fecal mass is coated with mucus and the loose diarrheal movements resemble the castor oil defecation so familiar to all of us. The tongue is coated, the abdomen distended, there is a general depression and the extremes of heat of summer, or cold of winter are felt acutely. There are evidences of auto-intoxication. These subjects suffer frequently with furuncle. Thick masses of mucus may be discharged before or after fecal defecation, and at times nothing but mucous discharges, irritating and annoying the patient. Casts of thickened mucus from some portion of the intestine may be passed and give the gravest apprehension to the patient.

Treatment. The treatment of this disease is also one to be studied with the greatest care, as often the simplest appearing case will cause the greatest difficulty or uncertainty in locating the cause. Very often it seems to be linked with some other disorder, and due to that disorder through some nervous disturbance. Therefore, we have many different opinions as to its treatment. Constipation, appendicitis, floating kidney, disease of the reproductive organs or the malposition of them in women, adhesions, enteroptosis, or invagination of the intestine produce a certain amount of nervous reflexes. Such a neurosis is the cause of a number of cases of hypertrophic catarrhal colitis, and must be treated accordingly. The removal of an appendix, the loosening up of adhesions by the sigmoidoscope and the Wales bougie, or a laparotomy, are often followed by excellent results.

Those cases most commonly brought to our attention, and which give most gratifying results to patient as well as physician, are due to digestive errors and constipation. The digestive trouble may be dependent upon many well-known causes—habits of eating, drinking, environment, temperament, and constipation caused by obstruction, pain from fissure in ano, hemorrhoids or polypi.

The Diet should be nutritious in order to sustain the patient

during a long period of treatment, but restricted to foods that are easily digested and not productive media for the bacteria which inhabit the intestinal tract. Foods containing starch and sugar are therefore contraindicated, because their rapid fermentation increases and favors bacterial growth. Coffee and tea are harmful to some patients and are best limited to the smallest amount. Milk as a single diet forms hard, in- soluble stools, which irritate the mucous membrane and often causes bleeding.

Stimulating drinks in the form of alcohol and the irritating condiments ordinarily used on foods are harmful and should be interdicted. A cup of hot water before breakfast or be- fore each meal is most beneficial in flushing out the stomach and moving the bowels. The bowels should be regulated if necessary with cascara. The resin-bearing cathartics should not be used because of their irritation to the mucous mem- brane of the rectum. To relieve the hypersecretions of the intestinal mucous glands, an alkaline laxative should be ad- ministered once each week in the constipated cases, and in some instances to those suffering from a diarrhea with a pro- fuse mucous discharge.

The administration of quinine in three to five-grain doses to these cases has been of benefit. Just why the quinine proved of value I am unable to say, when no plasmodia have been found in the feces. Again the administration of five grains of powdered ipecac two to three times a day have also been of service in other instances when no amebæ have been present in the intestinal discharges. Creosote carbonate is considered by some internists as an excellent remedy for its bactericide effect.

Bismuth, zinc sulphocarbolate, salol, betanaphthol, and ichthyol are all indicated for their selective action in arresting fermentation. Castor oil in five to ten drop doses repeated every two or three hours for a period of a few weeks often controls the diarrhea. Sulphide of calcium in one-fourth grain doses, given three or four times a day in some cases acts specifically, and is worthy of a fair trial.

Locally, the irrigation of the entire colon is easily accomplished in some patients if the preliminary cleansing enema is given to ensure an empty bowel. The irrigation is best given in the knee-chest position but may be effective with the patient in the Sims's position. One to three quarts of any of the following drugs in solution may be used each day for a period of two weeks, afterwards varying the irrigation to three times a week or oftener as indicated. Fifty per cent. peroxide hydrogen solution, ten to twenty per cent. fluid extract hydrastis, 1-5000 solution of nitrate silver, five to ten per cent. ichthyol solution or a five to ten per cent. solution of aqueous fluid extract of krameria. The krameria in all cases excepting the very severe form, has proved the most beneficial for its pain relieving and astringent properties and is best prepared according to the formula of Dr. Miller as given by Tuttle, which is as follows:

"Macerate one pound of bark of krameria in a long percolating tube for twenty-four hours. After this a mixture of twenty per cent. glycerine and eighty per cent. water is allowed to percolate through it. The percolate should be constantly stirred and refiltrated through the bark the second time. The filtrate is then evaporated down to one pound, thus obtaining an aqueous fluid extract containing grain for grain, all the therapeutic properties of the bark. The preparation should be kept in a dark place and not exposed to the air."

When ulceration exists the direct application of nitrate of silver in two per cent. solution through the sigmoidoscope is best suited to these cases, which may be done on alternating days of treatment with any of the other irrigation solutions recommended.

SPECIFIC CATARRHAL INFLAMMATIONS

These diseases of the colon, sigmoid, and rectum, represent different catarrhal inflammations, the result of a specific organism introduced into the body in various ways. The avenues of entrance are in some instances fairly well under-

stood, but in others our knowledge is meager and dependent upon the researches of the pathologists for further enlightenment.

The diseases classified as specific catarrhal inflammations are the tubercular, dysenteric, gonorrheal, syphilitic, erysipelatous. In addition to these, the intestine is liable to infection from nearly all the specific inflammations in general that affect the human body, dependent upon environment and hereditary influences.

Tubercular. Tubercular ulceration of the rectum, sigmoid or colon may be either primary or secondary. Many persons of tubercular tendency are sufferers from local tubercular inflammation of the rectum, which seems to be the most commonly affected. The disease may present itself in an ulcerative, papillary, miliary, or lupoid form. It may develop in the skin, muco-cutaneous, mucous or cellular tissue, due in all instances to infection from the tubercle bacillus.

Diagnosis. The diagnosis is made positive by finding the bacillus in the scrapings under the microscope.

Treatment. The treatment should be directed to the general constitutional condition of the patient and should include tonics and abundance of fresh air. The local treatment consists in keeping the ulcers clean and in gently stimulating the surface with solutions of either nitrate of silver, argyrol, or pure ichthyol, or by dusting over the surface powdered borax, iodoform, or aristol.

If possible, the knife should not be used in the treatment of these cases, as nature's barrier against infection in the form of granulation tissue surrounding these ulcerations should not be broken down or destroyed. When destruction of the mass seems necessary it should be accomplished with the actual cautery, thus killing the germs and sealing up the lymphatics and blood vessels to prevent absorption.

Dysenteric. Dysenteric ulceration is, as a rule, an acute specific inflammation of the bowel. The disease begins generally in the large colon and travels downward. This form of dysentery is now generally recognized as due to an infec-

tion from a specific micro-organism, representing three forms of the disease, classified as the *Amebic, Bacillary* and *Mixed Infection*. The Mixed Infection type may be due to ordinary germs found in the intestinal canal and represents a milder and more common disease.

Amebic Dysentery is due to infection by the *Amœba dysenteriœ*, which infiltrates through the mucous and submucous tissue. The disease may appear suddenly as an acute diarrhea, with blood and mucus, accompanied by irritation of
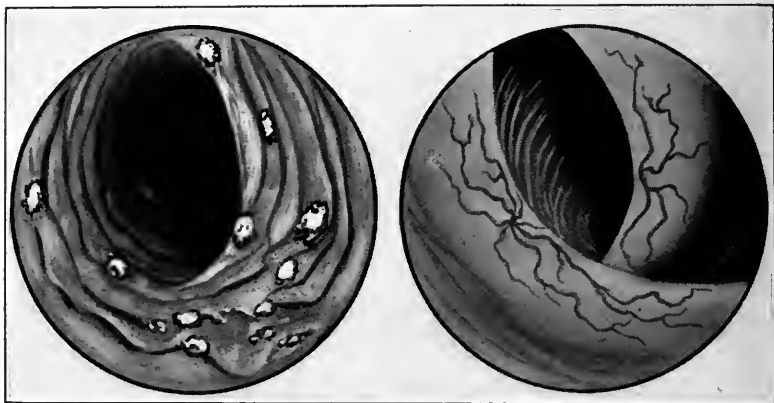
Fig. 17. Amebic dysentery. Typical ulcers—(left) on mucous membrane and (right) on the Houston valves.

the rectum, or it may be more insiduous in its onset, presenting a simple looseness of the bowels with a gradual increase in frequency. During the acute irritation in the rectum, a frequent desire to defecate, elevation of temperature and loss of appetite are fairly constant symptoms. In these cases severe constitutional weaknesses and pain are absent. Patients may have from three to forty movements in a day, seldom associated with much pain or tenesmus. They will often have one or two movements in a day, which are normal in character and during the same day have a number of blood and mucus discharges. The chief features of the disease are its variable periods of existence, which may extend

over years of quiescences and recurrences, and its irregular course of relapses and exacerbations.

Abscess of the liver, extreme anemia and localized peritonitis are its chief complications, often resulting in death without pronounced diarrhea.

The Diagnosis is proven by the microscopic findings, with a history of protracted or irregular diarrhea, with loss of strength and anemia. The appearance of the mucous membrane, when the infection has progressed to the rectum or sigmoid, is somewhat characteristic of the disease, in that the ulcers are usually upon the summit of the mucous membrane folds and the valves of Houston. The ulcer is irregular in outline varying from one-fourth to one inch in diameter, surrounded by a dark red or purplish zone. Usually, in the chronic form they appear gutter-like, with clean-cut overhanging edges which sometimes cross one another.

Treatment. The ameba bacillus grows very slowly in low temperature, losing its motility at 70° F. For diagnostic information the microscopic examination should be made while the feces or scrapings from the ulcer are at the body temperature and before the amebæ lose their motility.

Irrigation should be made possible from the cecum by means of an appendicostomy, or a cecostomy after the method of Gibson. The solutions recommended for irrigating the bowel are quinine from one to three hundred, or as low as one to one thousand, or a solution of formalin—one part to one thousand of water. A solution of nitrate of silver one-half to one per cent., used every second day for a number of weeks is very efficacious. The nitrate of silver may be neutralized with normal saline solutions. Peroxide of hydrogen is also of value.

Tuttle has found that simple cold water at a temperature of 65° or colder is as effectual as any of the above solutions, not only to wash out the bowel but destroy the amebæ. Patients may be placed in the knee-chest position and the fluid allowed to run slowly into the bowel. The quantity of cold water should be from two to three quarts and this treatment

should be continued every day for a period of several weeks, according to the ability of the patients to retain the fluid, and the presence of the germ. In acute cases this treatment is sometimes very efficacious. Quinine is best administered once a week during the course of treatment.

Localized ulceration may be reached through the sigmoidoscope or proctoscope, treated with pure tincture of iodine and dusted over with some antiseptic powder. The diet should consist largely of nitrogenous foods with a moderate restriction rather than absolute abstinence from the carbohydrates and fats.

Ipecac has been used for the treatment of amebic dysentery for some time with variable success, dependent probably upon the manner of administration and the control of the patient. Thirty grains of ipecac are recommended at a single dose on the first day of treatment, after the method of Manson in chronic amebic dysentery. Subsequently, the amount is to be diminished by five grains each day so that by the sixth day only five grains of the drug are administered. During the next succeeding week or ten days, five grains each night should be given. When the ipecac is administered in the salol coated pills, vomiting is infrequent, and the drug has the added advantage of being dissolved by the alkaline secretions of the intestine only. It is advisable to have the patient fast for about four hours previous to the administration of the ipecac and to be absolutely quiet for the same period afterwards.

Chamberlain in the *Journal of the American Medical Association*, April 6, 1912, is quoted as follows as to the " Experiments Undertaken to Test the Efficiency of the Ipecac Treatment of Dysentery." "So far as known, the first attempt to determine the value of the ipecac treatment of dysentery by laboratory methods has been made by a member of this board (Vedder). In these experiments cultures of amebas from a human stool were treated with preparations of ipecac from various sources and from different dilutions. As a result it was determined that fluid-extract of ipecac was

capable of killing amebas in dilutions of 1 to 10,000 up to 1 to 50,000, the amebacidal power depending on the particular extract used, and that emetin killed amebas in dilutions of 1 to 100,000. The commercial extracts of ipecac were further shown to vary considerably in total alkaloids, some being below the standard of the Pharmacopeia and some slightly above. The conclusion was reached that the ipecac treatment of dysentery should be given a more extended trial, that before treatment great care should be taken to be sure that the dysentery was caused by amebas, and that an ipecac should be used which is shown by actual analysis to contain the proper amount of emetin."

Of further interest he adds: " Effects of Ultraviolet Rays on Amebas: In view of the recently reported successes on the use of ultraviolet radiations in the sterilization of drinking-water the board carried out a series of experiments to determine the effects of these rays on amebas (Chamberlain & Vedder). It was found that the ultraviolet radiations would kill amebas, whether motile or encysted, as rapidly as they would kill *bacillus typhus* or *bacillus dysenteriæ*. Balantidia were also readily killed. The results are of much practical importance in the sterilization of water supplies in the tropics because sand-filters cannot be relied upon to remove amebas."

Bacillary Dysentery. This infection is due to the *bacillus dysenteriæ*, (*Shiga bacillus*), or one of its protean types. The bacillus is described by Shiga as a short rod with rounded ends, which resembling the *bacillus typhosus* and the group of colonic bacilli. No theory as to how the germ enters the human body has proven satisfactory.

Symptoms. The disease is generally ushered in with a chill, rise of temperature, abdominal pain, tenesmus and heat or burning in the rectum. The movements at first are watery and afterwards become entirely of a bloody character. Sometimes there is nausea, prostration, with collapse in severe cases. In the protracted cases emaciation is very progressive. Investigations have shown that the lesions are superficial in

character, more commonly found in the lower end of the colon or sigmoid and that the peritoneum is rarely affected. Death is due to the action of the toxins generated by the bacilli.

Diagnosis. The *bacillus dysenteriæ* is found in large numbers in the stools and the scrapings from the intestinal wall and are not demonstrable in the outer layers of the gut. Stricture is very apt to occur as the result of these ulcerations, as they have a marked tendency to fibrous contraction when healing. A positive agglutination is revealed in the blood.

Treatment. The bowels should be flushed out by the administration of calomel, magnesium sulphate or castor oil, and the colon irrigated every four or five hours. Normal saline and sulphate of quinine in one to one thousand solution are the irrigations most commonly used. Ipecac as recommended in amebic dysentery is also used for this disease. Sedatives in the form of opium to control pain and diarrhea should be administered in conjunction with tonic treatment. Serum therapy is just venturing into the field of the treatment of these dysenteric diseases and it is hoped that within the near future it may prove of value. The diet should be sufficient to maintain the strength of the patient and consist of nitrogenous foods, rice, milk and animal broths.

Catarrhal Dysentery. This disease is due to a mixed infection by bacilli commonly found in the intestinal tract and its infectious character is still a question of doubt. No specific organisms have as yet been isolated which might be considered responsible for the disease and until a certain etiological factor is discovered the disease had better be classified as a catarrhal inflammation.

Syphilitic Diseases of the rectum and colon are in the form of local manifestations. The symptoms, diagnosis and treatment are considered under the various phases presented in the text elsewhere.

Gonorrheal Proctitis is described under the chapter on venereal diseases.

Erysipelatous Proctitis has always proved fatal according to the few cases recorded. The disease seems to have been observed only in hospital practice.

Diphtheritic Colitis only occurs as a complication of the pharyngeal affection.

Ulcerative Colitis, Sigmoiditis and Proctitis, occur as the result of other diseases as marasmus, hepatic, kidney and central nervous diseases. Some diseases are probably the predisposing rather than the direct cause of the disease and make it probable that the ulceration is due in many instances to the invasion of a specific bacillus. It also follows as the result of a protracted catarrhal inflammation and if extending over a period of years is very likely to be associated with skin eruptions, as pemphigus and severe eczemas. These ulcers may be found anywhere in the large bowel, from the anal margin to the tip of the appendix. The ulcer varies in extent from one-fourth to one inch, and in some instances involves the entire circumference of the colon. The depth of the ulcer sometimes extends to the muscle wall or is so superficial as not to extend deeper than the submucous tissue. In very severe cases, the ulcer may resemble that of the duodenum or stomach, and penetrate the muscular wall to the peritoneum. There is a tendency for the ulceration to extend in a circular outline around the intestine and the number of ulcers may be as many as one hundred when superficial. The follicles of Lieberkuhn may be the seat of ulceration. The disease is said to begin in various ways either from the rectum and travel upward, or that it may begin at any point in the large intestine.

Symptoms. In some cases the disease seems sudden in its onset, with sharp lancinating pains over the colon attended with griping and a tendency to frequent movements of the bowel.

Patients in whom the disease is progressive in spite of treatment, or who have received no treatment, present a mental condition almost characteristic of the toxic effect of the disease upon the nervous system. I have found that men

of more than average intelligence presented a mental deterioration resembling imbecility. The suggestion of surgical interference is sufficient to cause them to cry like a child and beg to be left without such treatment. Their judgment as to any practical conception of their condition seems to be lost.

These symptoms disappear for a short while and the patient will feel apparently well for a few weeks, when they will recur again. The attacks last from one to several days. The stools at first do not contain any mucus, blood or pus. When the pain is persistent and the attacks frequent, blood and pus will be added to the movements and indicate ulceration. When the ulceration is high up, the pus and blood will be mixed with the stool and the feces contain dark, decomposed blood. When the ulceration is in the lower part of the sigmoid or rectum fresh blood will precede the stool. The amount of pain does not vary with the extent of ulceration nor with the ingestion of food. Pain is probably due to the irritation of the ulcerated surface by the intestinal contents which brings on irregular peristalsis, and is not due to the existence of the ulceration itself at any particular portion of the bowel. Patients may have as many as from five to twenty stools each day, which may alternate with short periods of constipation.

In dysenteric and acute catarrhal inflammation of the rectum and colon, there is ordinarily a constant tenesmus and a desire to empty the bowel, while in ulceration there is an inclination at periods to empty the bowel which is imperative at the time. During the intervals the patient does not suffer from either pain, tenesmus, or the desire to empty the bowel, but when the demand recurs it is imperative. The tongue, as a rule, presents a polished red color, with more or less brown in the middle, resembling the typhoid tongue. The frequency of movements causes great thirst. There is progressive loss of flesh accompanied by great depression and anemia. There may be a very irregular temperature varying from subnormal to 100° F. The course of the disease

may be from a few days, as the result of a perforation and subsequent peritonitis, to a long period of suffering due to an amylaceous degeneration.   The prognosis is always grave.

Diagnosis.   This disease is likely to be mistaken for a dysentery, typhoid fever, or malignant disease.   In malignancy, the history of the case shows the onset to be very much slower, the pain and the griping is seldom a source of complaint and constipation is marked.   Furthermore, after the bowels have moved the patients are comfortable excepting in the later stages of malignant disease when mucus and blood are indicative of the disease.   Malignant disease also has its peculiar pathognomic odor which is characteristic.   There is seldom any discharge of glary mucus in ulceration of the colon, but the blood and pus are very abundant.

Treatment.   When the disease is to be considered from the point of a secondary affection the chief indication is to find out the cause or the original trouble.   Local treatment should be directed to the ulceration of the colon or rectum by means of either a colostomy appendicostomy, or the use of the sigmoidoscope in the lower gut.   The patient should be kept on an unirritating diet.   The irrigation of the rectum or sigmoid should be with either the fluid extract of krameria or witch-hazel.   The patient should be in the knee-chest position and the temperature of the irrigating fluid from 110° to 115° F.   The krameria solution should be from five to twenty per cent. in strength and the hamamelis not stronger than ten per cent.   Either of these solutions will do much to control hemorrhage, the discharge of mucus or lessen the irritation of the bowel.   A combination of ergot, cinnamon, and hydrastis is recommended internally when the hemorrhage is excessive.   The patient should be given tonics in the form of iron and strychnine or alcohol, as would be indicated in cases suffering from septic poisoning.

Secondary Membranous Colitis is the term given to a condition in which there is a membranous deposit upon the walls of the colon secondary to some other disease.   The disease is not a local condition and sometimes presents no symptoms

referable to the sigmoid or rectum. In a few cases rectal symptoms develop and there will be a discharge of blood, pus and mucus.

Causes. The condition arises from a traumatism to the colon or from swallowing some corrosive substance, particularly mercury. Mercury in toxic doses is supposed to be absorbed in the stomach and resecreted in the colon, producing an excessive quantity of mucus or the so-called membrane, as the result of irritation or inflammation. Patients suffering from acute septicemia, or from pyemia in which the whole body is involved in the toxic process, with great debility, lowered circulation and vital depression are subject to this disease.

The original or primary disease of the kidney, lungs or heart may present the most marked symptoms with those of a secondary membranous colitis existing only as a complication.

When due to septicemia this disease is probably to be regarded only as a complication of septic infection. Diabetes is sometimes associated with this disease. Treatment is directed to the primary disease.

Follicular Colitis. The solitary follicles are found in the rectum, sigmoid and colon. These inflamed follicles are present much more frequently in the mucous membrane of the colon proper, with the abscess dipping down into the submucous tissue. They become inflamed as the result of a chronic hypertrophic catarrhal colitis which causes such a pressure upon the glands that there is a necrosis with the formation of a small well defined circular ulceration. These ulcers may be very large in number and scattered throughout the mucous membrane. It is said by some authors that a follicular colitis is found more commonly in children than adults.

Causes. It occurs as the result of some other inflammatory disease or during its course. It may be associated with a tubercular or chronic ulceration of the bowel.

Symptoms. When the disease presents itself in the sig-

moid and colon the symptoms are much the same as of a chronic hypertrophic catarrhal inflammation. When the ulceration is situated in the rectum or sigmoid the stools contain mucus and pus; there is a frequent desire to defecate and a marked tenderness over the sigmoid and the lower end of the spine. These patients suffer from a marked digestive disturbance, and present the symptoms of a hypertrophic catarrhal inflammation, having diarrhea alternating with constipation. When the disease is in the rectum the finger may feel the slight elevations giving the impression of miliary tuberculosis.

The Diagnosis is made with the proctoscope or sigmoidoscope and is dependent almost exclusively upon the visual aspect.

Treatment. Treatment depends upon the constitutional condition and the local condition in the form of obstruction or pressure. The condition may be due to a severe form of hypertrophic catarrhal inflammation which will have to be treated when low down in the intestine, through a sigmoidoscope or when high up in the intestine by means of irrigation from above. When the intestinal contents seem to cause irritation, the bowel should be cleaned out every second day or once a week, by the administration of epsom salts. This not only removes the irritating material, but also tends to deplete the congested mucous membrane. Castor oil given in small doses each day is of much value in controlling some cases where diarrhea is a pronounced symptom. In cases where the disease is located in the upper colon and it is impossible to use efficiently the rectal irrigations of krameria or witch-hazel, a colostomy or appendicostomy should be performed.

Valvular Cecostomy. This operation described as Gibson's valvular colostomy is applicable to the treatment of all the forms of chronic colitis. Appendicostomy appears more attractive to the greater number of surgeons for the reason that it seems easier to perform, yet it has a few disadvantages. Appendicostomy has the objection that the lumen of the ap-

pendix is sometimes obliterated and that the tension neces-
sary in some cases is so great in pulling the appendix out
through the abdomen that sloughing of the entire appendix
occurs as the result of interference with the circulation. This
sometimes happens even when the appendicial artery has not
been ligated. A cecostomy offers the favorable conditions
that the cecum lies directly in contact at the site where the

Fig. 18. Gibson's valvular colostomy—last tier of sutures.

opening is to be made and that the leakage from the opening
can be controlled equally as well as in appendicostomy.

Gibson's Valvular Colostomy is performed as follows: An
opening about one and a half inches long, parallel to and
just above Poupart's ligament is made through the abdomen.
The fibers of the muscular layers are split after the gridiron
method and the peritoneal cavity entered. An opening large

enough to admit a large-sized soft rubber catheter is then
made in the anterior longitudinal band of the cecum.   Into
the serous surface of the gut two or three tiers of sutures
are then introduced so as to form a valve or infolding of the
gut into the lumen of the intestine.   The last tier of sutures
are left long and brought through the edges of the wound,
in that manner fastening the gut in apposition with the ab-
dominal parietes.   The soft rubber catheter is allowed to re-
main in the wound for ten or more days until the parts have
healed.   After this the catheter may be reintroduced and
taken out as often as necessary for the purpose of irrigating.
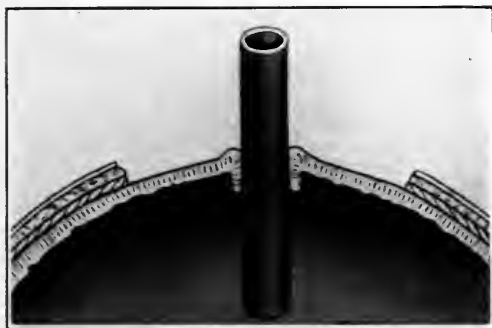The fecal fistula, which is very small, can be controlled by

Fig. 19.   Gibson's method, showing result of infold-
ing gut.

a small gauze pad and the patient permitted to go about his
work.

This affords the means of irrigating the entire colon from
the cecum to the rectum.   A solution of one per cent. nitrate
of silver followed by a saline solution is commonly used for
irrigating.   Solutions of krameria, witch-hazel, peroxide of
hydrogen, or plain water are valuable substitutes for irriga-
tions.

The operation does not turn the fecal current aside and
affords a method of lessening the irritation existing during
the course of any of these colonic diseases.   The operation
is practically without danger.   A small fecal fistula will close

spontaneously if not kept open by the use of the catheter; should it not close of itself it can be easily dissected out under cocaine anesthesia and closed by sutures.

Appendicostomy. The operation for appendicostomy may be performed by any of the modern preliminary methods of technique for appendectomy, but the gridiron or muscle splitting method probably ensures a more healthy and secure procedure for the protruded appendix. The following method is therefore suggested: A skin incision is made over Mc-Burney's point, one and one-half inches inside from the anterior superior spine of the ilium, on a line drawn from that point to the umbilicus. This incision should be from two to three inches long through the skin. The fascia and muscles are split in the direction of the fibers of the external oblique; the separation should be large enough to admit the introduction of two fingers to find the appendix and lift it out through the incision. The cecum may have to be drawn upwards to free any adhesion to the appendix. Should this be necessary the condition of the cecum should be noted, and returned, if its condition does not warrant cecostomy. Two fine silk or chromic gut sutures are passed through the skin and parietal peritoneum, then the appendix is transfixed through its muscular coat near its base, then tied; another suture is passed through the skin of the other side and the process repeated. The incision on both sides of the protruding appendix is closed by layers of sutures in the ordinary way. The appendix should be amputated about one-half of an inch from the skin and any bleeding temporarily controlled. A number 10 soft rubber catheter of the English Scale may be passed into the cecum for about three-quarters of its length. Should it be deemed advisable, or necessary to irrigate the bowel at once the free end of the catheter may be connected with an irrigator containing a saline solution at about 100° F. The quantity of this solution may be as great as several pints and the procedure so thorough as to wash the entire large bowel before the patient leaves the operating table. Further irrigation may be carried on continuously after the patient is put

back to bed and the colon washed freely with a warm physiological salt solution for several hours if necessary.

Subsequently, as the symptoms improve and as necessity dictates, a plug devised to keep the opening patent and prevent leakage may be introduced.

When it is desirous to close the wound the stump may be freed from the surrounding tissue and ligatures introduced
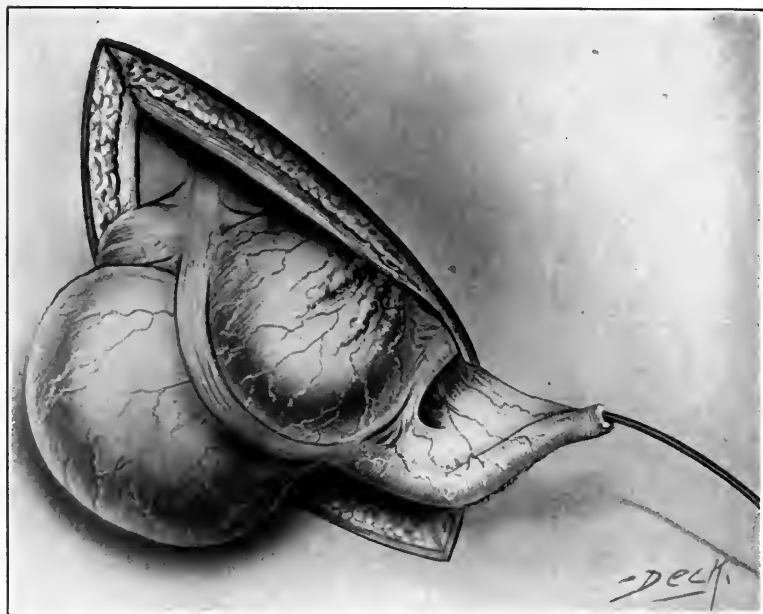
Fig. 20. Appendicostomy, showing cecum and appendix lifted up with mesentery, preserving the blood vessels.

so as to oversew the aperture. The stump is then allowed to drop back into the abdomen and the skin wound closed. In some instances touching the exposed mucous membrane with the actual cautery is all that is necessary to close the appendix.

Unfortunately some cases do not present this favorable course of treatment and owing to either an atrophy of the

stump or constriction of the appendix will bring about a complexity of symptoms. Such complications have caused the advocates of valvotomy to feel assured of the correctness of their views.

To offset the atrophy of the appendix the normal blood supply should be maintained. The blood vessels are contained within the layers of the meso-appendix which should not be removed, nor even injured during the manipulation of the appendix.

CHAPTER VIII

SIGMOIDITIS

THE sigmoid flexure is probably more vulnerable to simple catarrhal diseases than any other portion of the large intestine, because of its peculiar anatomical construction and its physiological functions.

Experiments with the X-ray made by Hertz demonstrated that in the average adult the fecal mass reaches the transverse colon within about ten to twelve hours after taking food and then takes from sixteen to twenty-four hours longer to reach the sigmoid flexure. Further, he demonstrates that the sigmoid flexure is the reservoir in which the fecal mass rests prior to its descent into the rectum and that the expulsive act really begins with the descent of the mass from the sigmoid to the rectum.

Diseases of the sigmoid flexure are divided into simple and specific inflammations, just as we recognize the many inflammatory processes in any of the portions of the intestinal canal. Diseases found in this portion of the alimentary canal are very frequently associated with similar pathological conditions affecting the entire large bowel. It is surprising, however, how great a number of supposed intestinal diseases yield to the treatment of the rectum and sigmoid when all symptoms attribute the disease to the entire large bowel.

The sigmoid may be the seat of, or there may be extending above or below a simple catarrhal inflammation, namely, acute atrophic or hypertrophic colitis or a proctitis. Or there may be specific diseases, such as gonorrhea, erysipelas, dysentery, tuberculosis or syphilis. In addition, we may have the consideration of follicular colitis, secondary colitis or ulcera-

tive colitis. The sigmoid flexure is also liable to secondary affections very often not recognized until their relation to the other organs and tissues is understood.

Affections of the sigmoid flexure are rarely seen before the twentieth year and are more frequent in the female than male. Affections of the sigmoid are termed sigmoiditis or perisigmoiditis, just as we speak of typhlitis or peri-typhlitis. Simple catarrhal sigmoiditis occurs in two forms, acute and chronic inflammations which are non-suppurative. Perisigmoiditis is either suppurative, an acute type, or non-suppurative which is chronic. One form may, however, merge imperceptibly into the other.

Acute Catarrhal Sigmoiditis, non-suppurative, attacks young adults most frequently. Intestinal parasites, foreign bodies such as arsenic or corrosive sublimate, impacted feces, diverticulæ, intussusception, volvulus and severe purging are mentioned as causes responsible for this disease. It resembles in character acute catarrhal proctitis. There is severe pain in the left iliac fossa, sometimes accompanied by a chill, rise in temperature, a coated tongue, possibly peritoneal irritation, no bowel movements and a slight amount of flatus will be expelled.

The acute symptoms may run the ordinary course of catarrhal inflammations and subside on the seventh or eighth day, or may become chronic. The attack may be an exacerbation in the sigmoid or a pre-existing colitis. After the acute symptoms subside, a painful, non-fluctuating, sausage-shaped mass may be felt, with its convexity to the right. This mass may persist for a month or two after the attack, should the disease become chronic. The severity of the onset will vary the clinical picture and the disease may terminate in ulceration. The history and clinical manifestations will differentiate this affection of the sigmoid from an appendicitis of the left side or a tubal disease.

Treatment. Acute catarrhal sigmoiditis must be treated the same as a proctitis of a like nature by relieving the cause and using remedies to soothe the inflamed mucous membrane.

When the inflammation is due to intestinal inflammation or putrefaction the bowel should be cleaned out by the administration of a saline cathartic or lavage, the patient should be put to bed and absolute rest insisted upon. The rectum and sigmoid should be irrigated with cold or warm water or by means of the double current rectal irrigator, for from ten to fifteen minutes. The temperature of the water should be that most agreeable to the patient. Instead of the water a solution of either of the following may be found more useful: Nitrate silver, 1-2000; hydrastis, 1-2 per cent.; or aqueous fluid extract krameria, 5 to 10 per cent. Krameria and witch-hazel have given me the best results. The irrigating fluid should return as fast as it enters and is therefore not dangerous. After the irrigation, the rectum should be drained out with the irrigator, and a sedative suppository of iodoform with opium inserted.

The Diet should be restricted to thin gruels and broths of beef, mutton or chicken, or prepared foods such as peptonoids or Mellin's, which are preferable to a milk diet in order to avoid constipation and irritation of the sensitive mucous membrane. Intestinal medication with bismuth, salol, beta-naphthol, sulpho-carbolate of zinc and copper sulphate, with opium, are all useful in these cases.

Chronic Hypertrophic Sigmoiditis may follow acute catarrhal sigmoiditis, with a hypertrophy of the mucous membrane, sub-mucosa, and the glandular elements. Proctitis of a similar nature is very likely to be associated. The " iliac roll," " sausage-shaped roll," or " sigmoid sausage," all meaning the characteristic indurated sigmoid, is revealed on examination. This indurated sigmoid is well defined by its peculiar sensitiveness on pressure.

The Symptoms of hypertrophic catarrhal colitis (membranous colitis, mucous colitis, chronic colitis, meaning one disease by several names), may be present in the form of mucous crises, constipation with alternating diarrhea and nervous disturbances. Brunton and Boas claim that an early morning diarrhea is a characteristic symptom of hypertrophic

catarrhal sigmoiditis and in my experience it has proven almost a positive indication of this affection.

Treatment. The treatment of this disease is almost identical with the treatment indicated for chronic hypertrophic colitis. The sigmoid should be irrigated through a colonic tube or the double current rectal irrigator, two or three times a week with the following solution: Five per cent. ichthyol, one to two thousand solution of nitrate silver in a quantity not less than two quarts. The irrigation fluid should be discharged at once. In addition, to relieve congestion, a weekly saline laxative should be given and the bowels kept regulated with cascara or rhubarb.

Chronic Atrophic Sigmoiditis manifests itself by an atrophy of the mucous membrane and glandular elements. This atrophy extends throughout the mucous membrane and glandular elements, without involving the tissue between. Its chief symptoms are those of atrophic colitis with which it is very often associated, and generally gives a history of a prolonged constipation. Local symptoms are referred to the rectum and anus in the form of hemorrhoids, fissures, and pruritis ani.

Treatment. This disease is the most intractable of the catarrhal conditions of the rectum, sigmoid or colon, and in some instances is best treated as an inherited or tertiary syphilis. Co-existing diseases such as fissure, hemorrhoids and pruritis ani, can be greatly alleviated or cured by irrigating the bowel with krameria, ichthyol or nitrate silver, as recommended for this condition in the colon.

Acute Perisigmoiditis is the term used to describe an inflammation on the outer surface of the sigmoid, and presents a picture of the collection of pus. A true perisigmoiditis may be suspected in the female when pelvic inflammations are excluded and the history of an entero-colitis is elicited. The disease may be secondary to diverticulitis or infection of the exterior of the bowel through the blood or the lymphatics as the result of an inflammation existing on the inside of the gut.

Symptoms. There are no pathognomic symptoms of perisigmoiditis further than the presence of pus in the form of an abscess. There is an elevation of temperature, accompanied by pain and possibly a chill, coated tongue and peritoneal irritation. The abscess, as a rule, is in the form of a diffuse tumor, irregular in outline, without nodulation, and may be situated as cited by Maurice Patel, in any of the following positions: " 1. Antero-inferior; anteriorly from the
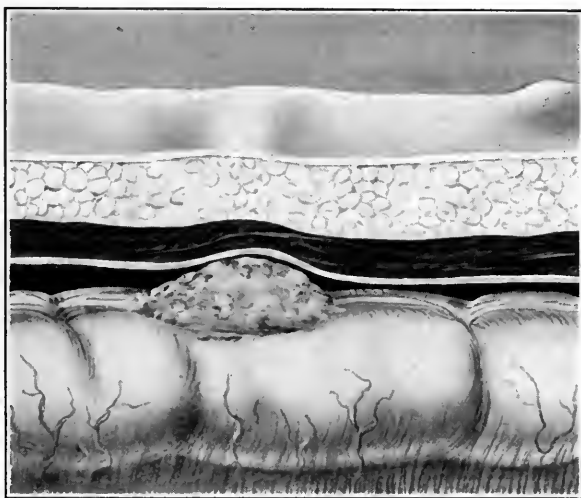

Fig. 21. Perisigmoiditis. Abscess on outer surface of sigmoid (schematic).

iliac spine along Poupart's ligament, intraperitoneal. 2. Anterior superior; to the left and slightly below the umbilicus, intraperitoneal. 3. Intramesocolic; lying between two layers of the iliac mesocolon, sub-peritoneal. 4. Retroiliac; lying between that part of the sigmoid which is covered on its front side with peritoneum and the post-abdominal wall in the loose tissue. 5. Lumbar abscess; in this variety the pus escapes through Petit's canal and invades the lumbar region."

A perisigmoid abscess, as a rule, perforates some portion of the bowel and peritonitis from this source is generally fatal.

As a secondary infection a left-sided phlebitis may be present or a left-sided inflammation of the broad ligaments may be associated with this condition.

Treatment. A perisigmoiditis of the suppurative type requires surgical treatment which should be over the site of the inflammation and before an extension to the peritoneum or rupture of the abscess occurs. A drain should be inserted and left in for five or six days, the same as the after-treatment for appendicitis of a similar nature.

Chronic Perisigmoiditis is due in most instances to a primary inflammation outside of the intestine or to an ulceration which has penetrated the bowel and in which still lingers sufficient irritability to produce an occasional exacerbation. The disease, ordinarily, is not limited to the sigmoid alone and may involve the surrounding tissue.

Symptoms. The localized pain and the evidence of a mass over the sigmoid may help in the diagnosis. Obstruction due to adhesion to the adjacent organs or to a narrowing of the sigmoid from an exudative process in its outer structure, is the cause of subjective symptoms.

Treatment. Indications for treatment will depend upon the condition revealed through the sigmoidoscope, or the origin of the trouble in a neighboring organ. The treatment may be directed locally through the sigmoidoscope, by means of irrigations, or surgically, when dependent upon a primary source of infection.

CHAPTER IX

COLOSTOMY

THE term colostomy is intended to indicate the operation when any part of the colon is brought out, attached to the skin and opened for the purpose of diverting the intestinal contents from further progress in the bowel below the opening. Colostomy is divided into five different varieties, dependent upon the position of the opening, as follows: 1. Left inguinal. 2. Right inguinal. 3. Transverse. 4. Right lumbar. 5. Left lumbar.

The left inguinal and left lumbar colostomy are the only two generally performed unless emergency forces the selection of one of the other varieties. The left inguinal and left lumbar are physiologically the most desirable sites for the establishment of an artificial anus.

Colostomy is indicated under the following conditions. 1. Ulcer of the rectum and lower sigmoid, due to catarrhal diseases, tuberculosis, syphilis or dysentery. 2. Recurrent and inoperable stricture with symptoms of auto-intoxication, which endanger life. 3. Non-malignant growths. 4. Adenomata and polypi, with symptoms of septic infection. 5. Congenital malformations, when there is an undescended rectum which cannot be brought down into its normal position, or where an atresia vesicales or atresia urethralis exists, endangering life and necessitating the turning aside the fecal current. 6. Cancer.

Colostomy is performed for the purpose of establishing either a permanent or temporary artificial anus through which the feces are expelled. The sigmoid flexure, transverse colon, or the ascending colon are sutured to the skin and opened in these operations.

Permanent Left Inguinal Colostomy is most commonly performed with the idea of permanently diverting the fecal current to relieve the irritation and obstruction from cancer, sarcoma, stricture, and non-malignant growths. It is an operation which may be performed under local anesthesia, if necessary.

The Operative Technique for the permanent left inguinal colostomy is as follows: The abdomen is prepared as for any abdominal operation, and a two and one-half inch incision is made about one and a half or two inches from the inner side of the left anterior superior spine of the ilium, almost at right angles to an imaginary line drawn from the anterior superior spine to the umbilicus, or McBurney's point on the left side. The incision is made through the skin down to the abdominal muscles, which are separated without cutting. The peritoneum is divided between two thumb forceps and brought up and sutured to the skin with catgut, immediately if desired. The sigmoid, as a rule, can be found with the index finger as the first piece of gut which presents itself. It can be easily recognized by the longitudinal bands, the presence of the appendices epiploicæ, also by its large size, thick walls and sacculations. A portion should be selected which will allow the formation of a proper spur without forming too sharp an angle or interfering with the circulation of the blood supply to the gut. If too long, a portion of the bowel may be amputated in order to overcome the procidentia which follows in these instances.

A portion should be chosen which permits the gut to enter the abdominal wound by pulling the intestine until it is taut, both from above and below the opening, which then forms an acute angle on the inner surface of the protruding gut, making a spur. The bowel is now fastened to the abdominal wall by silk or chromicized catgut sutures, passed through the skin, abdominal muscles, peritoneum, and the longitudinal band of the gut on one side, then reintroduced through the longitudinal band at the other side and carried back in the same manner and tied on the skin surface, one-half inch from

the point of introduction. This suture draws the upper and lower ends of the loop of gut together and thus anchors it to the wound. The abdominal incision is then shortened by sutures of catgut passed through the skin, abdominal muscles, and longitudinal band of one side and brought up through the muscles and skin of the other side, where it is tied. This should shorten the entire length of the wound to about one and a half inches. One or two additional sutures may be put into the wound if necessary. Hernia of the gut is prevented by introducing several interrupted catgut sutures about one-half inch apart, which include the skin, the serous and muscular coats of the intestinal wall. A piece of gauze or rubber tissue smeared with a sterile vaseline is placed over the protruding gut and sufficient sterile pads placed about the wound, to protect the gut from undue pressure from the outer dressings and abdominal binder, which is applied later.

The bowels should be controlled with morphine for several days, dependent upon the comfort of the patient and distention of the abdomen. The bowel should be amputated about one-fourth inch from the skin, two to four days after operation, dependent upon the urgency or the comfort of the patient, as adhesions should be formed entirely around and between the abdominal wall within that time. The wound is again dressed with sterile gauze and the patient kept in bed for a week or ten days according to the conditions of the wound.

Temporary Left Inguinal Colostomy. This operation is indicated for temporary use, but may be converted at any time into the permanent variety. As a rule it is only applied to those cases that cover a period of from one to six months and includes affections such as syphilis, dysentery, tuberculosis, traumatic ulcerations, hypertrophic catarrhal conditions and specific colonic infections. It is also a preliminary operation for diverting the fecal current prior to resection of the rectum or sigmoid for cancer, stricture or other indications. The first steps of the operation are the same as for the formation of permanent colostomy, but the manner of opening the

gut differs. The bowel is not completely divided in this procedure, so as to afford an opportunity to close the opening later.

Maydl's operation, as modified by Tuttle, for the establishment of an artificial anus is as follows: An incision three inches long is made through the skin and superficial fascia in a line with the external oblique muscle, beginning at a point one inch above and one and a half inches inside of the anterior superior spine of the ilium. The fibers of the external and internal oblique muscles are then separated with a dull
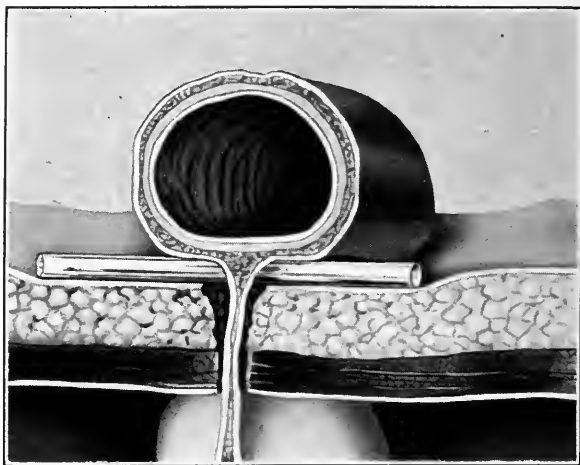

Fig. 22. Colostomy. Cross section Maydl-Reclus method.

instrument and drawn apart. The fascia transversalis is divided with the knife on a line with Poupart's ligament. The wound should be thoroughly dried and after all bleeding vessels have been ligated, the sigmoid is dragged out of the wound, a small incision made through the mesentery and a glass rod about one-fourth inch in diameter and four inches long is passed under it. The glass rod should pass beneath the gut and its ends should rest upon either side of the wound. Care should be taken to avoid the blood vessels, when making the incision through the mesentery. The lower angle of

the wound is then closed by silk or catgut sutures, passed through all its coats in such a manner as to compress the lower leg of the intestinal loop against the glass rod. Several fine chromicized catgut sutures are then introduced at the two angles of the wound, including the skin, peritoneum, muscular wall of the gut and then through the peritoneum and skin of the other side. A small pad of iodoform gauze is placed under the projecting rod of each side and along the edges of the wound close to the intestine. The projecting gut should be smeared with sterile vaseline and covered with gauze. The gut is then dressed with sufficient gauze to protect it from the pressure of the adhesive straps and abdominal bandages. The intestine is never opened at this time.

Should the gut become greatly distended by gas, a trocar should be inserted to allow its escape. The opening made by the trocar should be closed at once by Lembert's sutures and sealed with collodion. The patient should be placed in bed and the hips elevated and sufficient morphine given hypodermically to control vomiting and intestinal peristalsis for ten or twelve hours.

The gut may be opened with safety after the first six hours although it is better to wait two or three days if possible. The opening should be made by an incision through the longitudinal muscular band opposite the mesentery, extending from the superior angle of the wound to one-half inch below the glass rod. A transverse incision is then made at the lower end of this wound, involving two-thirds of the circumference of the gut. These incisions cause the two upper triangular flaps to roll backward, while the segment at the lower incision folds downward and inward, practically closing the lower aperture. The opening of the intestine requires no form of anesthesia The fecal current is thus prevented from entering the lower segment of the sigmoid and no portion of the intestinal wall is sacrificed.

When the artificial anus is to be closed, the edges of the T wound are sutured together without opening the peritoneal cavity. The lower gut may be irrigated by lifting up the

transverse flap. The glass rod should be retained in position with small strips of adhesive plaster for two weeks or longer, as indicated.

When the bowel is distended to such a degree as to cause alarm some surgeons prefer to introduce a Paul's tube. This permits the escape of the gas or fecal matter. The tube is inserted after first placing a circular purse-string suture around the portion of the gut where it is intended to introduce the tube. The segment of gut is then raised by pulling on a
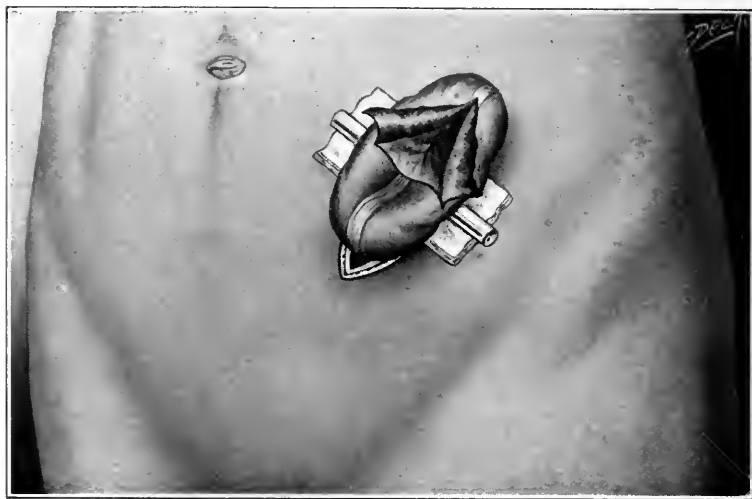

Fig. 23. Tuttle's incision for opening the gut for temporary inguinal colostomy.

loop of the purse-string suture at one end and on the ends of the suture below. Then a crucial incision is made into the bowel within the area surrounded by the purse-string suture. The Paul's tube has a double flange at the end, which is intended to fit inside the gut and between which the purse-string suture is tied tightly so as to prevent its slipping outward. A rubber drainage tube should be attached to the distal end of the Paul's tube and the contents of the bowel allowed to drain off into the vessel provided for that purpose.

This idea has proven no better to me than the canula, when we consider the apparent safety which almost invariably follows the use of the trocar and canula with immediate sutures. In some instances, as pointed out by Sir Charles Ball, neither of these efforts to relieve the distention are of any benefit, as there will be no discharge of gas or fecal matter for several days. It is probable that in these cases the traumatism to the bowel while operating produces a temporary intestinal paralysis; that the extreme distention has caused a kinking above the field of operation; or, that a reverse peristalsis has been instituted as the result of the operation.

Transverse Colostomy is the making of an artificial anus in part of the transverse colon. In this operation the bowel is
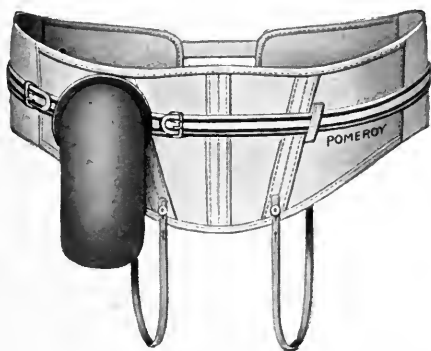

Fig. 24. Colostomy bag and bandage which may be made for either right or left side.

attached to the external abdominal wall just above the umbilicus. The technique of the operation is about the same as that employed in the left inguinal colostomy, excepting that the site of the artificial anus is in the median line. The mesentery of the transverse colon ordinarily is not so long as the sigmoid mesentery, and a procidentia of the gut is not so liable to happen.

Left Lumbar Colostomy is an operation almost obsolete in modern surgery on account of the ease with which inguinal colostomy can be performed with the experience, judgment, and facilities afforded the average surgeon. The technique

of the operation is as follows: The patient is placed upon
the right side, turned somewhat on his face and held in this
position with a sand bag or pillow under the hips.   An in-
cision is begun one and a half inches back of the anterior
superior spine of the ilium just below the border of the last
rib.   This incision should extend downward and forward
for about four and a half or five inches, parallel with the
crest of the ilium.   The fibers of the external oblique and
latissimus dorsi muscles should be separated and held apart
with broad retractors.   The fibers of the internal oblique are
then separated in the same manner by blunt dissection, thus
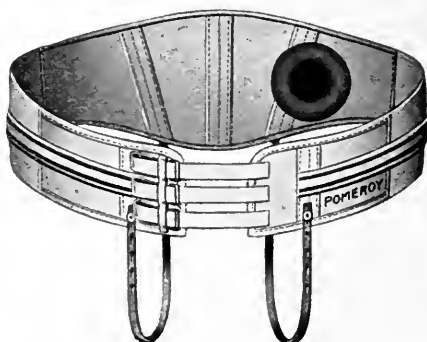exposing the lumbar fasciæ.   These fibers run transversely

Fig. 25.   Inside of the colostomy pad.

and may be cut or separated.   The external border of the
quadratus lumborum and the transversalis fascia is then ex-
posed.   All bleeding should be controlled and the operating
field cleared.   The wound is then well retracted and the
transversalis fascia incised, exposing the sub-serous fat in
which the kidney is imbedded and in front of which the colon
lies.   Caution should be taken in tearing the fat apart with
the fingers or blunt instrument so as to avoid wounding the
kidney or ureter, should it be misplaced.   It is wise to locate
the kidney during this dissection, as Bryant claims the colon
lies just in front of its lower border.

It may be difficult to find the colon if the gut has collapsed

or when the fat is very abundant. Ordinarily the colon is sought at too great a distance from the spine. The only guide needed is the fact that when a piece of the gut is reached without entering the peritoneal cavity it must be the desired colon; but this will be dependent upon whether the mesentery is of normal length. When the gut has been found it should be rolled slightly forward in order to expose its posterior surface, and silk ligatures passed through the skin and one-third of the circumference of the gut and then through the skin on the opposite side of the wound. The gut is then incised longitudinally and the loops of the sutures are drawn out through the wound and cut in the middle. The ends are then tied to those passed through the skin of the same side. The gut should be dragged with forceps outside of the wound so as to avoid soiling the field of operation with the escaping feces. Gauze should be packed on each side of the wound before the intestinal incision is made and kept in position until the first discharge of gas and feces. Afterwards the intestinal canal should be packed with gauze to prevent further escape. The parts should then be washed, the packing around the gut removed, the skin and intestine brought together with interrupted silk sutures. This technique may be varied by opening the gut immediately as described, or not for several days.

Witzel's, Weir's, Bailey's and Tuttle's methods are variously modified operations devised for permanent colostomy, in which the bowel is dragged beneath the skin or muscles to a variable distance from the original field of operation, making a permanent artificial anus, which is compressed by the intervening tissue, with the idea of controlling the fecal discharges.

The After-treatment. It sometimes occurs that after the operation for colostomy there will be no movements of the bowels for several days, and it is then necessary to give a laxative or injection of plain water. As a rule, after the first evacuation, the bowels continue to move more often and dressings once or twice a day are necessary. However the

intestine accommodates itself to the altered condition after a while, normal evacuations each day become a rule, and the patient often knows beforehand when the bowel is about to empty itself and makes the necessary preparation.

While such patients have no power of controlling the bowel movements, they are able to endure a tolerable existence, often attending to business and social functions without giving evidence of their sad condition. A belt, with a rubber pad having a pneumatic tube border, or to which may be attached a rubber bag into which the contents of the bowel is emptied, may be fitted to prevent the soiling of the clothes by the escape of mucous or fluid fecal matter. A truss with a metal plate controlled by a spring is sometimes used with success.

CHAPTER X

CLOSURE OF ARTIFICIAL ANUS

THE ordinary methods in vogue for the surgical treatment of these cases include removal of the spur and re-establishment of the normal channel either by resection with subsequent end-to-end anastomosis, lateral anastomosis, or the simple restoration of the skin and mucous membrane coverings.

Pressure Necrosis is produced by variously devised clamps, such as the Dupuytren enterotome, Gross's modification of the enterotome and that devised by Gant. All these instruments are especially designed to produce pressure necrosis of the spur, which removes sufficient tissue at that point to allow the fecal current to pass unobstructed into the lower segment of the gut.

The instrument devised by Gant has the special advantages of being of little weight and that the shank is bent at right angles to the clamp, permitting it to lie flat upon the abdomen. The jaws of the clamp are fenestrated, about one-half inch broad and about one and one-fourth inches in length. Gant has devised a clamp applicator or forceps to facilitate the application of these clamps. The applicators are not an absolute necessity as the clamp can be pressed upon with the fingers sufficiently to allow it to be applied over the spur without great difficulty. The clamp is allowed to remain in position until it comes away of itself, usually about six to nine days after its application, but this time will be dependent upon the amount and character of the tissue removed. The patient should be kept in bed until the clamp sloughs out, and the pain controlled with morphine, if needed. After the spur has been cut through, the skin and edges of the wound should

be freshened and drawn together with catgut or silk sutures.

End-to-end Anastomosis. Should the preceding operation fail to produce desired results, or be impracticable, end-to-end anastomosis, after resection, is sometimes necessary to establish the normal intestinal channel. An end-to-end anastomosis is performed as follows: The parts are first thoroughly cleansed and the artificial anus closed with continuous catgut
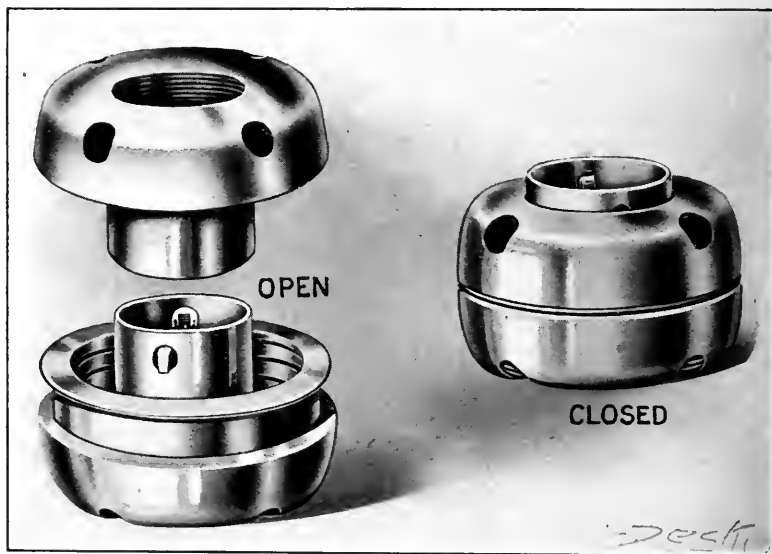

Fig. 26.   Murphy's button.

sutures to prevent the escape of the bowel contents. The skin about the opening is divided by a semicircular incision and the bowel dissected from its attachments and brought up through the wound. The portion of the bowel which includes the spur is then excised and an end-to-end anastomosis made by means of the Murphy button. A lateral anastomosis or any of the other various operations used for anastomosis of the intestine may be performed at this point.

The Ligation Operation. This consists of introducing a

ligature through the spur as deeply as possible, which is then tied and allowed to slough through. This operation is not to be recommended for the reason that the needle penetrates the mucous membrane of the bowel and is very apt to carry infection, also that it simply divides or splits the tissue. After the tissue is divided, the skin and the edges of the wound are freshened and drawn together with catgut or silk sutures, as in the clamp operation.

Tuttle's Technique. The plan of operating for the establishment of an artificial anus suggested by Tuttle is intended to facilitate the subsequent closure and appears very practicable. It has been my misfortune in a very protracted case to find that the flaps atrophied and were of no benefit in the attempt at closure of the gut which was later accomplished by the pressure necrosis method described above. However, the operation does not alter the chances for a successful closure by any other method.

Tuttle's technique, after following the Maydl-Reclus method of operation for inguinal colostomy, is to make an incision through the longitudinal muscular band opposite the mesentery, extending from the superior angle of the wound to half an inch below the supporting glass rod. A transverse incision is then made at the lower end of this incision involving two-thirds of the circumference at the gut. By these incisions the triangular flaps in the upper segment are allowed to curl upward. The straight flap at the lower end of the wound falls downward and inward, partially closing the lower aperture. The fecal evacuations are thus brought out on the surface of the abdomen, preventing escape into the lower segment of the bowel. The lower segment may be opened at any time for the purpose of irrigation and treatment by simply lifting up the transverse flap. In addition Tuttle claims that no portion of the intestinal wall is sacrificed. When it becomes advisable, the artificial anus can be closed by simply suturing the edges of the T-shaped wound together, without opening the peritoneal cavity.

CHAPTER XI

PROLAPSE OF THE RECTUM

PROLAPSUS ANI, Procidentia Recti and Prolapsus Mucosæ Recti are the somewhat indefinite terms used to describe the eversion and prolapse of the rectal walls. If one bears in mind that the anus is simply an aperture, prolapsus ani is meaningless. Prolapsus mucosæ recti is applied correctly to the prolapse of the mucosa singly.

Procidentia Recti includes prolapse of all of the rectal coats, which are the longitudinal and circular muscles and the mucous membrane. It is the complete prolapse of the rectum. In this variety we have three degrees of prolapse.

First Degree. The prolapse begins at the margin of the anus, and its external surface is continuous with the skin surrounding this aperture.

Second Degree. The prolapse begins at a point more or less above the anus and descending through that portion of the gut which remains in position protrudes through the anal orifice.

Third Degree. The prolapse begins high up in the rectum or sigmoid flexure and extends down into the ampulla of the rectum, but does not protrude through the anal orifice. In other words a third degree prolapse of this variety is an invagination of the sigmoid or rectum which does not protrude externally.

Archocele or Rectal Hernia is another condition of prolapse and may be a complication in the complete prolapse. It is the protrusion into the rectum of some portion of the intestine, usually, the sigmoid flexure. It appears in the form of a globular mass, which may descend so far as to protrude externally. Rectal hernia is sometimes the direct cause of a

rectal prolapse, with which it may be associated. While authorities differ as to the physical characteristics of a rectal hernia, it seems most probable that it is a sagging of the rectal walls, with a separation of the longitudinal muscle fibers, just at the bottom of the pouch of Douglas. Rectal hernia is sometimes due to a ptosis of the transverse or descending colon, which has dropped so far into the pelvis as to press against the rectal wall. The X-ray proves that an exaggerated ptosis
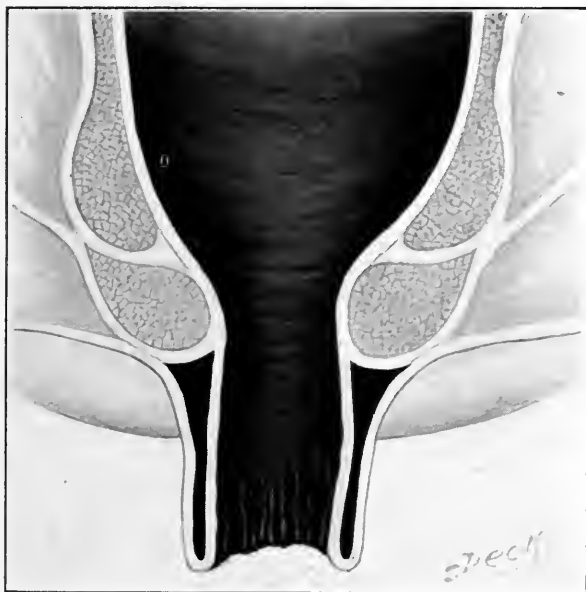

Fig. 27. Incomplete prolapse of the rectum.

of these parts is quite common. The Trendelenburg position reduces this form of hernia readily, as a rule.

Rupture of the Hernial Sac may complicate either prolapse or rectal hernia. This may occur in either a hernia, which protrudes through the anal orifice, or when confined within the rectal ampulla. Spontaneous rupture may occur or be produced by a traumatism made during attempts at reduction of the prolapse, in which the hernia coexists. More com-

monly, it occurs spontaneously while lifting heavy weights, straining at stool, and while vomiting. The small intestine or other contents of the hernial sac may protrude without the prolapse being visible as might occur with the third degree of complete prolapse, or be contained within the rectum, in the form of a prolapse; while, if complicating the second degree of complete prolapse, the intestine might be forced outside of the body. Diagnosis is readily made from the appearance of the large or small bowel, when it presents itself. There is immediate collapse, accompanied with very acute pain, shock and protrusion of the intestine into the rectum or outside of the body.

This condition is always serious on account of the liability of infection to the peritoneum. The operation is therefore a serious one and attended with a high mortality. Reduction of the hernia by means of the Trendelenburg position is the first step after attempts at asepsis. If the hernia is not associated with a prolapse, an abdominal incision in the median line and a repair of the rectal wall made from that side, is the safest procedure. Should a prolapse complicate the condition, a sigmoidopexy can be done to relieve that condition, at the same time.

INCOMPLETE PROLAPSE

Prolapsus Mucosæ Recti. The connective tissues and submucous tissues of the rectal wall in health is held so loosely that a certain amount of sliding downward or an exaggerated eversion is easily permitted. In that way, a somewhat permanent laxity or elongation of the normal mucous membrane may take place, which in course of time or from the causes hereafter mentioned, produce an incomplete prolapse of the rectal mucous membrane. This form of prolapse is the most frequent, and occurs constantly as the result of any acute inflammatory process resulting in edema, hemorrhoids or acute proctitis.

Causes of Incomplete Prolapse. Vesical calculus, phimosis,

whooping cough, polypi, constipation, and undue straining are all responsible in some instances for the onset, or the continuance, of an incomplete prolapse of the rectum. Rectal prolapse is a positive index of a low vital condition, excepting when a definite history of a fall or other traumatism can be obtained, particularly in children.

Sex. Males seem to be more frequently afflicted with incomplete prolapse than females.

Fig. 28. Complete rectal prolapse, first degree.

Age. Individuals of any age suffering from diarrhea, or who lack sphincteric tone which permits a sagging of the mucous membrane are often afflicted for a long time after the subsidence of the exciting causes.

Occupation. The question of occupation as a cause of prolapse in children is generally eliminated, excepting in those permitting or required to carry burdens beyond their strength, which might easily be sufficient cause to originate or loosen the whole structure of the lower rectum.

Improper feeding during infancy is probably a more frequent factor in the cause of prolapse in either the adult, or child than is credited. A direct line of questioning the adult will often elucidate the vague or meager history of attacks of incomplete prolapse during childhood.

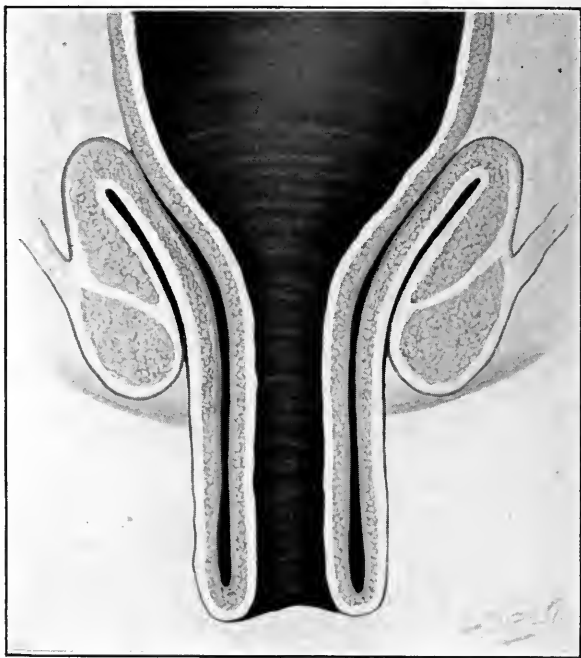**Symptoms.** There is a protrusion, which is either lateral

Fig. 29. Complete rectal prolapse, second degree.

or bilateral, a discharge of mucus, often loss of control of the sphincters, increased frequency of micturition and bowel movements, and there may be hemorrhage, and a dragging sensation.

As a rule these cases do not protrude more than two and one-half inches; there may be little pain and the condition appear to be nothing more than an exaggeration of the normal eversion of the rectal mucous membrane which occurs at every

stool. At first the prolapse is easily reduced, or it may recede without pressure, but as the mucous membrane grows thicker from the inflammatory process, sphincteric contraction prevents its recession.

My opinion is that children seldom suffer from any form of hemorrhoids excepting the thrombotic and nævoid and that supposed hemorrhoids are a part or wholly a prolapse of the mucous membrane.

Diagnosis. The diagnosis between complete and incomplete prolapse is a matter of importance in children only. An incomplete prolapse in the adult is insignificant as to danger. The diagnosis of the complete variety is easily made in adults because the muscles and tissues are so developed that the circular fibers of the rectal wall are recognized by their crescentic folds. The *incomplete variety* seldom exceeds two inches, and one side is generally longer than the other. In the *complete variety*, the protrusion is generally equal on all sides of the circumference, measuring from two to four or five inches in length in adults, as a rule.

In incomplete prolapse, the aperture is generally oval or circular and in the middle of the protrusion. In the complete variety, the aperture is oval or crescentic and pushed backward, because the meso-rectum holds the rectal wall posteriorly. In the incomplete variety there are almost invariably well-marked sulci, anteriorly and posteriorly; and in this variety there are only two layers of the mucous membrane and the submucous tissue contained in the protruding mass. In the complete, the mass contains two layers of mucous membrane, two layers of submucous tissue, and four muscular coats which form a solid mass by comparison to the incomplete.

Palliative Treatment. In the treatment of incomplete prolapse one should hold in mind that it is simply a sliding down of the mucous membrane, and that in children the constitutional condition is probably the underlying cause, no matter what may have been the exciting cause. A chronic diarrhea, or any one of the enumerated causes, may have been the

original trouble, leaving a loss of tone or an atrophy of the muscle, permitting sliding down or relaxation of the mucous membrane.

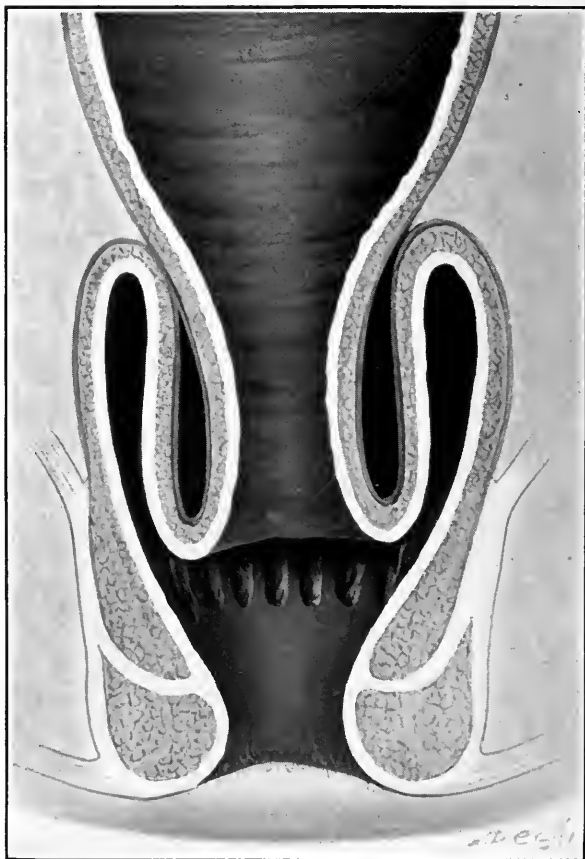Palliative treatment may be tried when the prolapse is of

Fig. 30.   Complete rectal prolapse, third degree.

short duration and slight in degree, but otherwise surgical treatment should be instituted to obviate the danger of strangulation.   Reduction after each movement of the bowel is important, and should be done as soon as possible after the

protrusion has occurred. For this purpose the thumb or small finger should be bound around with absorbent cotton slightly oiled, and pressure made steadily and gently into the lumen of the gut. The patient should be placed upon the side, or in the knee-chest position, and the mass pushed beyond the upper border of the internal sphincter. After reduction the patient should remain in the prone position for at least a few hours. The application of the method suggested by Powell of strapping the buttocks after reduction is oftentimes successful. The strapping should be done with the child lying on its side, and with three-inch adhesive straps, passing from one trochanter to the other, drawing the buttocks close together and folding them in. The posterior edge of the adhesive strap should only reach as far front as the anterior edge of the anus. The straps applied in this manner will allow defecation and necessitate removal only once a week. Defecation should be permitted only while the child is on its side or in the recumbent position. Children under three years of age should be held in the vertical position while defecating, to avoid straining. It is very important that the food should be made as near perfect as possible, and the child kept out of doors for the benefit of fresh air and exercise. Should constipation exist, it is best treated with cascara, cod liver oil, or with olive oil. As a general tonic and laxative the following will prove of value.

Ol. Phosphor ....M. xii.
Aetheris ....M. xxiv
Ol. Morrh cum Maltine. ad .... ʒii.

Sig. One teaspoonful two or three times a day, to a child over a year old.

General tonic treatment in the form of fresh air, exercise when the child is old enough, strychnine, arsenic, iron and improvement of environment complete the palliative treatment of these cases.

Surgical Treatment of this condition is limited and dependent, in any variety, upon the degree of prolapse,

In cases of incomplete prolapse the application of pure nitric acid, recommended by Allingham, is of great service and will prove successful in a majority of such cases. The application is made in longitudinal lines varying from one-eighth to one-fourth of an inch in width and about one-half of an inch

Fig. 31. Archocele or rectal hernia.

apart. Care should be exercised to confine the action of the acid by immediately applying a blotter to the part so as to take up the excess, and further neutralize with bicarbonate of soda.

Linear Cauterization (Van Buren's) with the actual cautery is also of much value in these cases, and is done with the cau-

tery at red heat, making three, four, or more longitudinal stripes. Be careful not to burn too deeply at the apex of the prolapse, as the peritoneum sometimes reaches a point within one and one-half inches of the normal anal opening in children.

The modified clamp and cautery hemorrhoid operation has proved most satisfactory in the hands of many operators,

Fig. 32. Complete rectal prolapse, showing circular muscular contractions.

when care is exercised to include only the mucous membrane within the grasp of the clamp. This operation accomplishes all that the above methods do and with a greater degree of certainty. After the prolapse is reduced, three or four sections are clamped and cauterized, as indicated by the amount of tissue prolapsed.

The success of either of these two methods is largely de-

pendent upon the retention of the prolapsed rectum long enough after the operation to allow union and cicatrization. The tenesmus following treatment by either method is easily controlled by the injection of olive oil, bismuth subnitrate and tinc opii, in the following combinations.

Ol. Olivæ ....ʒi
Bismuth Subnitrate ....gr xxx
Tinc Opii ....♏ ii-ix

This injection should be given into the rectum twice daily for four or five days. The opium may be omitted sometimes on the third or fourth day. The bowels should be opened on the fourth day, by a simple water enema and the sweet oil and bismuth should be continued for a week after the discontinuance of the opium. An ounce of a solution of ten per cent. witch-hazel in water should be injected after the bowels have moved so as to ensure cleanliness. Constipation is best relieved with sweet oil internally or the cod liver oil as recommended above. Cascara sagrada may be necessary.

These methods, however, are only applicable to the incomplete variety and possibly to some cases of the first and second degrees of complete prolapse.

The Ligature Operation for hemorrhoids used in various ways for prolapse has never appealed to me, on account of the liability to infection and hemorrhage, and therefore I have had no experience with that method.

COMPLETE PROLAPSE

Procidentia Recti. This form of prolapse, while occurring frequently in children, is most common in the adult. The erect position of man in walking tends to throw the weight of the contents of the abdomen and pelvis on the levatores ani, and, in weakened individuals, a loss of muscle power easily follows in the form of a prolapse of the rectal wall.

Causes. Among the causes of complete prolapse of the rectum are an enlarged prostate, enteroliths, prolapse of the

uterus, proctitis, fecal impaction, polypi, tumors of the sacrum and coccyx and chronic intestinal diseases. Age seems to be a factor in the very young and old, due to a lack of muscle tone, while in the middle-aged and thoroughly healthy individual, traumatism and irritation within the rectum or in the surrounding tissue, seem most commonly the cause. Paralysis of the sphincters from operations or from lesions of the spinal cord, rupture of the perineum, and loss of muscle tone in the levatores ani, overdistention of the rectum and persons who lose weight from some other disease or from overwork, are also included in the enumeration of causes.

Symptoms. There is a protrusion of a large mass, greater in most instances than could possibly occur in the incomplete prolapse; there is pain; a discharge of mucus, which may be tinged with blood; a dragging sensation; loss of sphincteric control causing frequency of movements; loss of weight; more or less hemorrhage; and if ulceration takes place, in cases of the second or third degree, there is a constant desire to expel the mass from the rectum.

Diagnosis. The complete prolapse will present a gurgling sensation when an invagination exists, more marked in the second degree; there is a space between the anal canal and the mass, while in the prolapse of the mucous membrane in the first degree prolapse, the external surface is continuous with the skin. This condition means an involvement of all the coats of the rectum including the mucous membrane.

First Degree. The whole circumference of the bowel participates in the sliding down or protrusion, beginning at the muco-cutaneous junction which carries with it from two to five inches of the rectal wall. This feature distinguishes it from a prolapse of the second degree.

Second Degree. The prolapse begins higher up, just above the internal sphincter muscle, and protrudes through the anal orifice.

Third Degree. The prolapse begins high up in the rectum or sigmoid flexure and extends down into the ampulla of the rectum, but may or may not protrude through the anal orifice.

In either of the complete varieties one must bear in mind that the mass consists of more than mucous membrane. The sense of feeling will distinguish a thoroughly firm mass of muscle tissue, representing two layers of muscle and two of mucous membrane. The size of the protruding mass, its structure, and the transverse furrows of the protrusion due to the contraction of the circular fibers of the rectum, are so pronounced as to make the diagnosis clear. One must bear in mind that a polypus is a firm, rounded tumor, which may present and resemble the prolapse of the second degree; that malignant growths may have some of the same characteristics, but are more apt to be eroded or broken down and bleed. Hemorrhoids are so superficial and limited in extent that it is almost impossible to confuse them in the diagnosis.

Complications. The dangerous complications are peritonitis due to a rupture of the rectal wall, or a rectal hernia induced by lifting or straining.

Prognosis. A spontaneous cure often occurs in children who are properly fed and restrained from producing the rectal prolapse. Surgical treatment in children is never successful without medical treatment and the above precautions.

Long standing cases in the adult are best treated by surgical means at the onset, and it will be dependent on the judgment and experience of the operator, as to the selection of the method of surgical procedure best suited to the particular case. The results will be found amazingly good as to an ultimate cure, and to the comfort of the patient in the majority of cases.

Palliative Treatment. Removal of the cause which may be in the form of hemorrhoids, neoplasm, stricture, ulceration or any of those previously mentioned. In children phosphorous, iron and strychnine, as suggested above. If the prolapse is held for several weeks in its former position and the general tone improved, a permanent cure occurs very often.

Treatment, in the form of cold water, astringent solution of alum and tannin, iron, zinc, silver, krameria, and infusion of oak bark, often give good results, but are to be considered

only palliative in their effect. The strength of any of these solutions should be made according to age, and extent of the prolapse. When any of them produce nausea, or colic, a weaker solution should be used or the remedy stopped altogether.

Hypodermic Injections of strychnine, ergotine, nux vomica or carbolic acid, are variable in their success, and may be classified as uncertain on account of the complications which follow in the form of abscess or fistulæ.

Compresses in the form of pessaries and trusses for the support of a prolapse cause dilatation and a relaxation of the sphincter muscles, and while their use may give temporary relief and comfort, in time an exaggeration of the trouble is more likely.

Massage for the sacrum and coccyx and internally to the rectum itself gives more of a sense of comfort than any curative value.

Electricity, either of the faradic or galvanic variety, administered through the specially constructed instruments for applications from the interior of the rectum, is of much benefit in weak and debilitated patients where more radical treatment cannot be instituted, and when a treatment can be given two or three times each week. The good results of the electrical treatment are probably due to its tonic effect upon the muscular and circulatory apparatus.

Constitutional Treatment is again emphasized for the good effects produced in all of these cases, both young and old.

Drastic Purgatives are contraindicated in all forms of rectal prolapse and care should be exercised to guard against the administration of such drugs, or the selection of them by the patient. Palliative treatment should not extend for more than two to three months.

Reduction. When there is much swelling or edema of the parts, which might interfere with reduction, the local applications of compresses, saturated with a twenty-five per cent. solution of boroglyceride, will be found efficacious in most instances. The same method should be followed in the

treatment of the adult or child in attempts at reduction. Hot cloths should be applied in preference to cold. In these severe cases, the cold causes contraction of the blood vessels and interferes with the circulation in the protruding part, in many instances so poor as to be in a sloughing condition.

Sims's or the knee-chest position is best for attempts at reduction. The knee-chest position induces the aid of gravity in the reduction of the prolapse. The mucous membrane should not be bruised while introducing the finger into the lumen of the protruding mass. When gangrenous destruction of the prolapse has taken place no attempt at reduction should be made, as immediate amputation is the best treatment. In these cases, the prolapse may be so large as to have within it a portion of the peritoneum, and the attempt at reduction which has failed will expose the peritoneal cavity to infection before operative measures can be instituted. Should this occur, either suture or clamp the ends until adhesions have formed, in order to close over the peritoneal surface.

Operative Treatment. Operative treatment aims to produce sufficient adhesive inflammation between the various coats of the rectum to prevent slipping; it also aims to remove redundant tissue and reduce the caliber of the rectum and anus to normal size. These three objects must be constantly in the mind of the operator in order to produce good results.

The modern operations for the radical cure of prolapse are based upon the best surgical principles and are productive of good results, but space would hardly allow the technical description of all. In the selection of any operation for this condition, the surgeon is best guided by the particular case, than to select at random the technic of any particular operator.

Allingham's Method of Nitric Acid. By this method nitric acid, or the acid nitrate of mercury, is used in the form of an application. A general anesthetic is given and the prolapse dragged down, washed off and dried. The acid must be applied all over it, care being taken not to touch the verge of the anus or the skin. The part is then to be oiled, and the

rectum stuffed with wool. A pad must then be applied, outside the anus, and kept firmly in position by an adhesive plaster. The buttocks are, at the same time, brought close together. If this precaution be not adopted, when the patient recovers from the chloroform, the straining being urgent, the whole plug will be forced out and the bowel will again protrude. When the pad is properly applied, the straining soon ceases, and there is little or no pain. The bowel should be confined four days, the strapping is removed and castor oil administered.

Allingham states that this treatment is generally applicable to prolapse in children, and failure rarely follows if properly carried out, but sometimes the acid may have to be applied more than once. The virtue of this method is questioned by most American surgeons, as very few have the courage to employ it and safer methods are more generally known and used. Nitric acid when applied in its pure state is so strong an agent that it produces a slough and subsequent ulceration, very likely to result in stricture. There is absolutely no control of the acid thus used, unless neutralized, and then the degree of cauterization is very uncertain.

Linear Cauterization is far superior both in results and in the control of the cauterant. The method used generally is to take a very small quantity of absorbent cotton, which is wrapped around a wooden applicator and dipped into the acid; this is laid upon the prolapsed gut, at points about one-half inch apart around the rectum, so as to produce cauterizations with healthy strips of mucous membrane between them. These linear cauterizations are carried over the margin of the anus to the highest portion of the prolapse. Small retractors should be used to hold the lumen open while the applications are being made. The after-treatment as suggested by Allingham is well employed in these cases, with the addition of a drainage tube extending above the packing to allow the escape of gas or blood, should hemorrhage occur. In the application of nitric acid, care should be exercised not to burn too deeply at the highest point, as in children the peri-

toneum anteriorly reaches to within an inch and a half to two inches of the anal orifice.

Van Buren's Linear Cauterization Method. The patient is anesthetized; the prolapse is dragged down as far as it will come, washed off and dried, and the cautery applied in lines about one-half inch apart all around the circumference of the gut, extending from the margin of the anus to the highest point of the prolapse. The Paquelin cautery should be at red heat and only the mucous membrane should be cauterized. Care should be exercised not to perforate the muscle in order to avoid the involvement of the peritoneum while applying the cautery, should it have descended into the prolapse. A drainage tube should be introduced, with or without the ordinary gauze wound around the middle of it. Vaseline may be used on the gauze and tube to facilitate its introduction, and a safety pin put through the distal end of the tube in order to prevent its slipping into the rectum. A compress should be applied to the wound, best held in position with adhesive straps which draw the buttocks together. The bowel should be confined for four or five days, and the patient kept in bed in the recumbent position. At the end of this time, a small enema should be given through the drainage tube, about two hours after the administration of a dose of epsom salts. The drainage tube and gauze is best removed at this time. The success of this operation will be the retention of the prolapse in its normal position and care should be taken to administer laxatives to regulate the bowels and to prevent a dragging down of the prolapse. The patient should be kept in bed, and the bowels moved while in the recumbent position, for a period of two to three weeks.

This method is very successful in the treatment of complete prolapse of the first degree during the early stages, before there is great thickening of the tissue in the prolapse itself, and a weakening of the sphincter muscle. The operation is almost always successful in children and in many adults, when applied to the first degree of complete or an incomplete prolapse. In my experience the best method in

the application of the clamp and cautery operation is to push the prolapse back into its proper place, and after having determined the amount of tissue necessary to cure the prolapse, remove three or four strips of mucous membrane from various portions of the circumference within the clamp.

Duret's Operation, or Rectorrhaphy, is similar to that for prolapsus vagina. The mucosa is dissected out in the form of elliptical flaps extending from the summit to the base, leaving two lateral pillars. The muscular walls are then folded in by buried silk or catgut sutures and the edges of the mucous membrane are brought together by superficial sutures. Duret removes triangular flaps of skin from the margin of the anus and sutures the edges of the wound together. In this manner the orifice is narrowed both anteriorly and posteriorly. In this operation the cavity of the ampulla is made into a cylinder of smaller caliber the same as would result from a combined colporrhaphy and perineorrhaphy.

This operation accomplishes little more than the clamp and cautery and has the disadvantages of a greater liability to infection, followed by abscess and fistulæ.

Whitehead Operation. The application of the principles of the Whitehead operation for hemorrhoids is made use of by some surgeons. In this procedure the mucous membrane is dissected from the prolapse at the muco-cutaneous junction and drawn down, excised and the cut borders sutured to the margin of the anus. The muscular walls of the gut are thus tucked or folded and held in position above.

De Lorme advises this operation in prolapses of four to six inches in extent, and it is described as a distinct operation under his name. He claims that this reduplication produces a narrowing of the canal and increases the strength of the sphincters. The operation has all the disadvantages of the Whitehead operation as applied to hemorrhoids, namely, stricture at the lower end of the rectum, and sepsis.

Tuttle claims that one advantage in this operation is that in cases of prolapse due to hernias through the rectal cul-de-

sac, the thickened ring will furnish an obstacle to the descent of the peritoneal pouch, and in this manner prevent recurrence of the prolapse.

Operations so far enumerated are limited to the mucous membrane and are chiefly applicable to the incomplete and the first degree of complete prolapse, but might be applied in the judgment of the operator with success to many of the mild second degree prolapses.

The operations suggested in the following list involve the deeper tissue, and are applicable to cases of severe second degree and third degree complete prolapse.

The Diefenbach and Roberts Operation consists in the removal of a triangular section of the gut at the posterior commissure. An incision is made, extending from one and one-half inches upward in the bowel, with the base of the triangle about one inch in width, which includes the excision in part of both sphincters at this point. The operation has for its object the reduction of the caliber of the lower end of the rectum and anus. The success of the procedure is dependent upon primary union, which is very uncertain. Should failure occur, an increased prolapse is almost a certainty, together with incontinence of feces. This operation does not accomplish any more than those before mentioned, and is of value only in conjunction with sigmoidal fixation or sigmoidopexy, Peters' infolding of the gut, rectopexy or suspension of the rectum upon the sacrum.

Fig. 33. Peters' operation for rectal prolapse. Smaller picture shows cross-section of infolded gut.

Lange's Operation. The rectum is scarified and narrowed by buried sutures, which produce an infolding in the lumen of the rectal ampulla. The operation con-

sists of making an incision from the posterior margin of the anus upward alongside the coccyx, and dissecting off the levatores ani, then infolding the gut by a line of Lembert's sutures through the muscular coats.

Peters' Operation is somewhat similar to Lange's, only he makes an abdominal incision, large enough to draw up the sigmoid and infolds the lower portion of the gut on its anterior surface with Lembert's sutures. The ends are left long enough to pass through the abdominal wall, forming support or suspension for the rectum.

Amputation. Amputation of the prolapsed mass of gut has been practiced for many years, both by the ancient and recent surgeons. The knife, clamp, cautery, elastic ligature, or ecrascur are employed for amputations. The knife is preferable where the removal and excision of a part of the entire circumference of the gut is intended in contradistinction to resection.

Resection and Excision Operations are both accompanied by the dangers of hemorrhage, stricture, infection of the peritoneal cavity, and injury to the small or large intestine, if a rectal hernia coexists. There is always the difficulty to determine how much bowel should be resected. Either of these operations can be avoided in the majority of cases, and might conservatively be relegated to only those cases where gangrene or extreme strangulation make it imperative.

Mikuliez's Operation. In this operation the patient is best placed in the lithotomy position, not only to facilitate operative procedure, but to reduce a hernia, should it be contained within the prolapse. The field of operation is thoroughly cleansed and the gut brought down as far as possible by traction forceps, or grasped with volsella forceps by an assistant. At this stage of procedure it is wise to see that any coils of intestine, which may have been contained within the prolapsed gut, are reduced. A packing should be inserted into the gut to plug the field of operation from further discharges from the intestine. Incision is then made through the mucous membrane on the anterior surface of the prolapse. This in-

cision is carried through the entire thickness of the outer cylinder until the peritoneal cavity is opened. All bleeding should be controlled at once. Continuous sutures are then put through the peritoneal ends, closing that cavity at once from the possibility of further infection at that point. The incision is then carried down through the inner cylinder until the mucous membrane is again encountered. The muscular layers and mucous membrane are then united, making a complete end-to-end anastomosis at the point of amputation. These incisions should be made in sections dependent upon the extent which will facilitate the technique during the operation.

During the operation the parts are steadied and prevented from retraction by allowing long ends to the sutures in the muscular and mucous membrane layers. The mucous membrane may be steadied into even apposition by a continuous catgut suture, applied around the entire circumference. The long ends of the sutures should be cut as the progression is made, and the need of retraction is unnecessary. The wound should be dusted with iodoform, aristol, or boracic acid, and over this several layers of flexible collodion should be applied. The packing previously inserted in the rectum should be removed and a drainage tube inserted and sterile gauze applied externally. The bowel should not be moved earlier than the seventh or eighth day and some form of opium administered per rectum to prevent peristalsis. The advantages of this operation are the care and precision with which the peritoneal cavity can be opened and emptied of any loop of intestine or omentum which might be contained within the prolapse.

Treves' Operation consists in exposing the prolapsed gut beneath by severing the mucous membrane around the bowel near the base of the protrusion. The patient is put in the Trendelenburg position and the intestine is caused to retract, then the prolapse, which still protrudes, is cut away near the anus, bleeding is arrested and the peritoneum pushed up. The rectal coats are prevented from slipping upward by applying clamps. The peritoneum is next closed with catgut

sutures and the ends of the bowel united by silk or gut sutures near the anal margin. The sutures should include all the muscular and mucous membrane coats of the rectum.

Kleburg's Bloodless, and Fowler's Operation for resection accomplish somewhat the same results.

Mathews makes a circular incision around the protruding mass just outside the anal ring, and a second incision around the bowel near the distal end of the prolapse. These cuts extend through the mucous membrane only, and the portion of the mucous membrane between the incisions is dissected off; the divided ends of the mucosa are united with catgut sutures, and the gut shortened. This operation has proven successful in the hands of the originator, but seems to have little merit more than supporting temporarily the mucous membrane by the adhesions formed between it and the submucous layers.

Sigmoidopexy or Fixation of the sigmoid is a very satisfactory operation in complete prolapse, particularly in the third degree, in which there is an invagination of the sigmoid or rectum. These cases are almost beyond relief by any other method so simple and free from any great danger. By this procedure the bowel is suspended or fixed to the abdominal parietes much the same as the operation for ventral fixation of the uterus.

The operation is to be performed as follows: An incision is made over the outer side of the left rectus muscle, on a line below the umbilicus. The sigmoid is located and drawn upward until taut. The gut may then be scarified over one of the longitudinal bands and fastened to the inner abdominal parietes by three or four chromicized catgut or silk sutures placed about one-half inch apart. These sutures should include all the coats of the bowel excepting the mucous membrane. The sutures so placed may be used to close the wound, if left long enough to be carried out through the skin.

Rectopexy of the rectum upon the sacrum is accomplished by various operations, but suspension of the rectum in this position does not accomplish any more than sigmoidopexy,

and is attended with great danger of infection.   These operations are quite difficult in their accomplishment and are in many instances unwarranted.

Fig. 34.   Sigmoidopexy.

Rickett's Ligation Operation in the treatment of rectal prolapse is probably of value only in the first degree complete prolapse and in the incomplete prolapse. A specially constructed needle of more than a semi-circle form is necessary,

which is threaded with kangaroo tendon. The needle is introduced just within the anal margin and made to traverse a half circle in the submucous tissue, where it is brought out and reintroduced at the same point, continuing under the mucous membrane until a complete circle is made, so that it emerges at the original point of entrance. The ligature is then tied so as to include all the tissues within its grasp. From two to six areas are ligated, according to the severity of the case. When the rectal coats are prolapsed, as would occur in the complete variety, the ligatures are placed deeper so as to include the muscular coats. Dr. Rickett claims that the irritation caused by the ligatures is such as to produce sufficient adhesions to effect a cure.

Sick's Operation for prolapse of the rectum in children, as modified by Ritter, is as follows: An incision is made from the tip of the coccyx to the edge of the sphincter ani muscles. The loose connective tissue behind the rectum is then separated with a blunt instrument up to the promontory of the sacrum. This procedure detaches the rear wall of the rectum and in addition a passage is made entirely around the lower segment of the rectum to permit the passage of a broad strip of gauze which is worked or drawn through, completely encircling the rectum. The ends of gauze are then fastened to the skin above the coccyx. A second piece of gauze strip is pushed up between the rear wall of the rectum and sacrum. The skin incision is then sutured excepting at the coccygeal end where the gauze strips emerge.

The operation is intended to cause extensive adhesions to the surrounding tissue, prevent prolapse and cure the condition.

The tampon of gauze should be removed on the fifth day and the normal evacuation of the bowels permitted after the operation. The operation is applicable to complete prolapse of the first, second, and some cases of third degree, but is hardly justifiable in the incomplete prolapse.

This operative procedure presents one serious objection in cases of partial prolapse when the bowel wall is adherent an-

teriorly, and great care must be exercised in such cases not to puncture the rectal wall. When the prolapse presents this condition puncture may be avoided by boring or tunneling up to the point of firm attachment on each side only. The results will be quite as good from my experience.
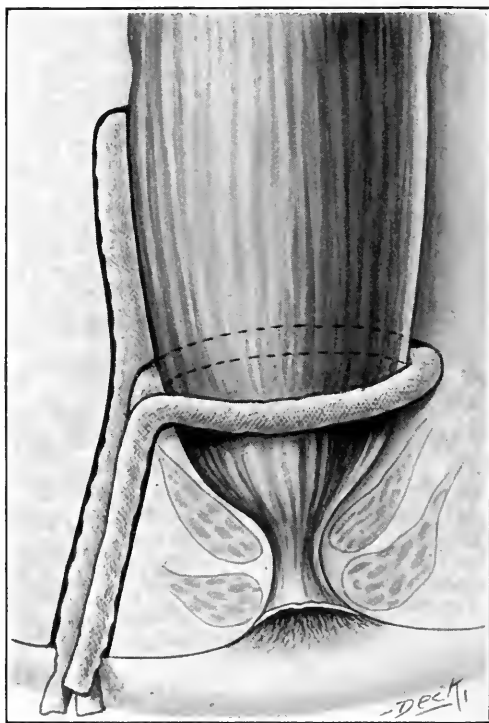

Fig. 35.   Sick's operation for rectal prolapse in children.

The results reported of two cases operated upon by this procedure are most favorable. The children were able to be up and walking about at once; defecation was not interfered with and examinations seven and fourteen months later confirmed the advantage of its simplicity and safety.

CHAPTER XII

FISTULÆ

A FISTULA is the result of an abscess, or burrowing of pus
to a greater or lesser degree into the surrounding tissue. The
term has been derived from the Latin word *fistula,* meaning
a reed, pipe or tube-like channel, and is applied almost ex-
clusively to the fistulous tracts found in the rectal region.

Varieties. Fistulæ are variously described by different au-
thorities. The division recognized generally will be con-
sidered as follows: the complete, the blind external and the
blind internal.

Fistulæ are also classified according to the tissue through
which they pass or beneath which they may ramify, as fol-
lows: Those which pass beneath the skin are called subcu-
taneous; those beneath the mucous membrane, submucous;
where they traverse the tissue underlying both they are called
submuco-cutaneous; again those which pass on the outer side
of the muscles of the rectal wall or anus are called submus-
cular. The names horseshoe, complex, and complicated fis-
tulæ are applied to other forms that describe the shape, while
others designate the organs involved, such as the recto-vagina,
recto-vesical, recto-urethra and recto-labial.

Complete Fistulæ. This form of fistula has two openings,
one external opening in the skin, and one internal opening
in the rectal walls, which make a complete fistulous sinus. It
may be tortuous, or it may have lateral branches which have
extended from the main tract. As a rule, the internal open-
ing of a complete fistula is situated between the sphincter
muscles, unless there is a submucous burrowing; it may then
be higher in the rectum.

Blind External Fistulæ. In this form there is an opening through the skin only.

Blind Internal Fistulæ. The blind internal fistula opens
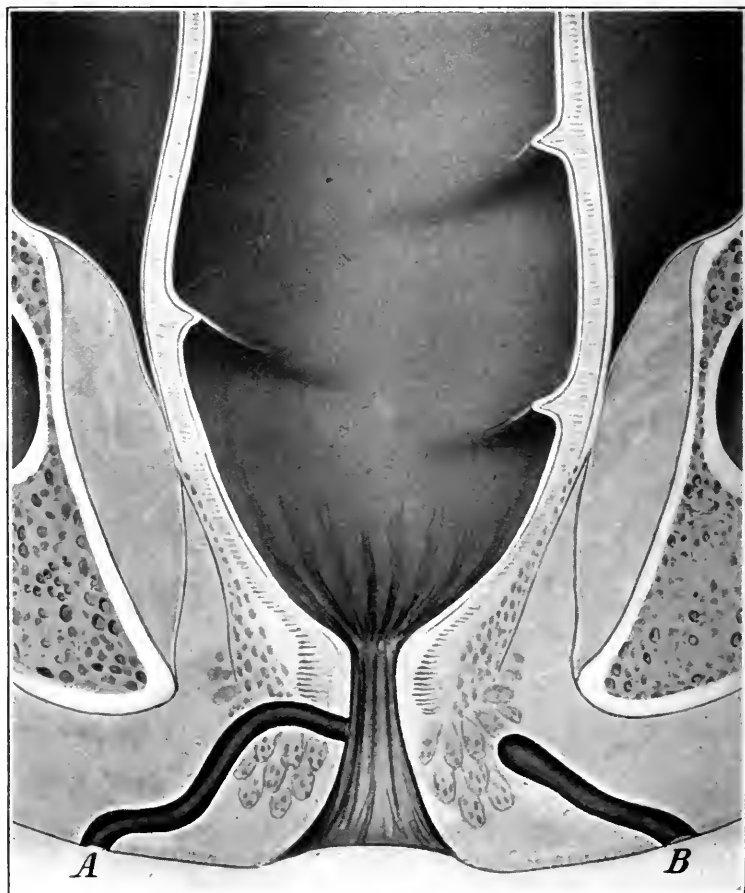
Fig. 36. Fistulæ. A, complete; B, blind external.

only into the rectum. There is no opening on the skin surface. The fistula may burrow beneath the mucous membrane, the muscles, or sub-muco-cutaneously.

Etiology. Fistulæ are the result of an abscess,—the origin of which may be specific or non-specific — which does not heal, the result of imperfect drainage and reinfection. Males
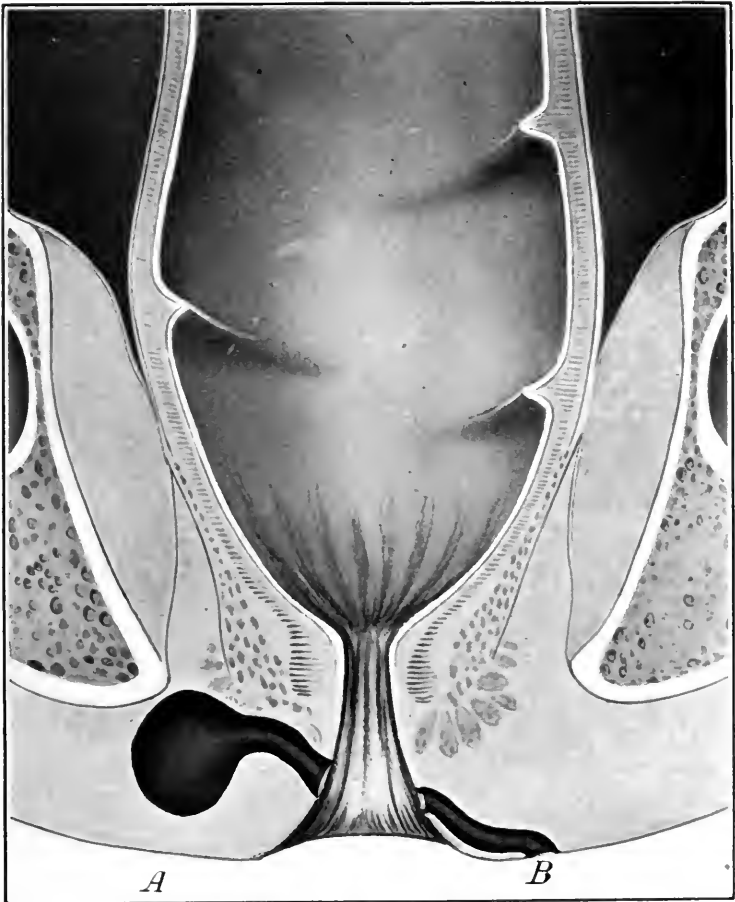
Fig. 37. Fistulæ. A, blind internal; B, complete subcutaneous.

are more often affected than females. The disease is one of middle adult life, but there are many exceptions to this statement, as children sometimes suffer from fistulæ at a very

early age. The constitutional condition is probably one of
the greatest factors in abscess formation in children, as tuber-
culosis, syphilis, and protracted intestinal diseases are marked
predisposing causes. In the adult, constitutional conditions
and catarrhal inflammations of the rectum seem to be the most
pronounced factors in the formation of abscesses as the re-
sult of infection carried either through the blood vessels, the
lymphatics, to an ulceration in the mucous membrane of the
rectum following an injury; or to the presence of a malignant
or non-malignant growth, or invasion from a neighboring
organ or bony structure.

Symptoms. The discharge of pus, with the occasional fill-
ing up of the fistulous tract, sometimes accompanied by fever,
pain, a chill and malaise, are the common symptoms. Occular
and digital examination with the aid of a small probe will
reveal the fistula.

Diagnosis. A fistulous opening on the skin resembles
somewhat a pimple with a central ulceration and a ring of
indurated tissue, which may be surrounded by an area of red-
ness. The opening internally on the mucous membrane is
more readily found by the sense of touch, which will make out
a pin-head opening with an indurated ring completely sur-
rounding it. The eye seldom discerns the small opening, not
only on account of its small size, but from inability to hold
the parts in a position to see the opening. A fistula may be
found at any part of the rectum, dependent upon its abscess
origin. It may vary in size, and in the number of branches.
It may be a long, short or a tortuous tract. There may be
more than one fistula existing independently at the same time.
In tubercular patients, or those suffering from specific diseases,
there is generally the characteristic appearance of such disease.

A typical fistula is best illustrated by the complete fistula,
which opens internally in the rectal cavity and externally on
the skin. One opening in the rectum is the rule, but there
may be an exception to these simple forms. More than one
external opening is apt to be found more frequently than a
number of internal openings. External fistulæ are more

easily recognized, as the external opening can be seen and the tract readily probed. The blind internal fistula has the usual characteristic doughy swelling over the tract, with subjective
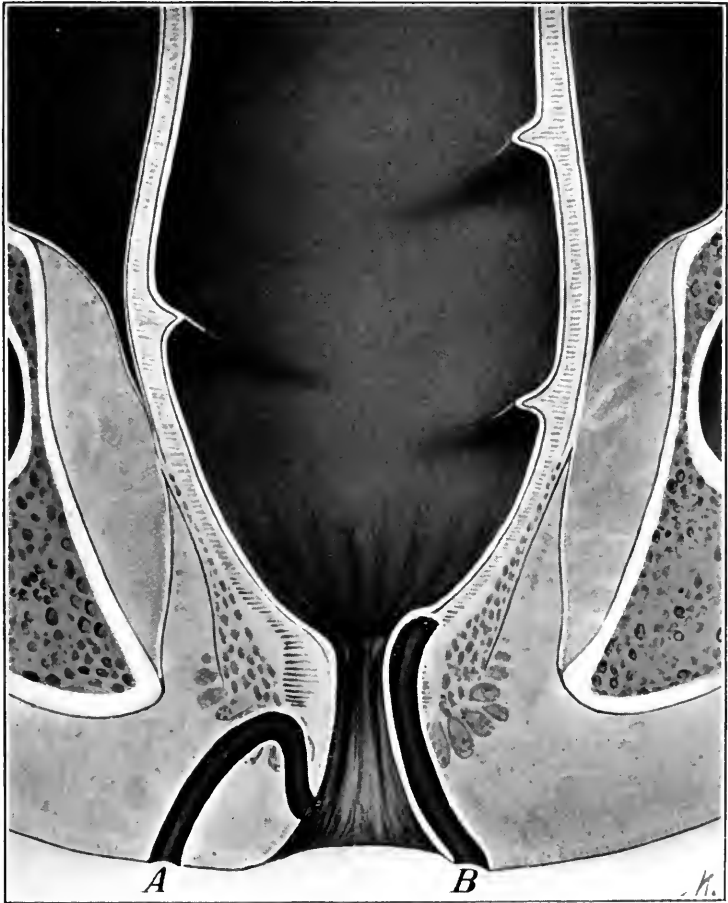

Fig. 38. Fistulæ. A, complete submuscular; B, incomplete submucous external.

symptoms of painful defecation, the discharge of pus from the rectum, occasional filling up and with possible fever.

The direction of a fistula may be found by palpation and

probing. In some instances it will be found very tortuous and the bending of the probe may be necessary to keep within the proper sinus. Care should be exercised not to force the probe through the sinus into the surrounding tissue.

The theory for diagnosis of complete or blind internal fistulæ suggested in recent literature on the subject by Goodsall and Miles will be found correct in from ninety to ninety-five per cent. of cases, and is therefore of great diagnostic value. If one can find the true course of the sinus with a probe, by such a correct theory of diagnosis the operative procedure becomes very easy.

This scheme divides the anal ring into an anterior and posterior section. By drawing an imaginary transverse line through its center, it is divided into halves, the upper portion being the anterior, and the lower portion the posterior. The complete fistula, having an opening on the skin surface posteriorly to this transverse anal line, will be found to have its internal opening in the posterior median line between the sphincter muscles. A fistula having its external opening anteriorly to this imaginary transverse anal line, will be found to have its internal opening on a direct line between the sphincter muscles.

The procedure laid down by Goodsall and Miles is quoted as follows:

" The course taken by the main track of a blind internal fistula when the internal opening is in the middle line posteriorly and deeper than the external sphincter, is towards the surface in the right or the left posterior quadrant. In those cases in which the internal opening is superficial to the external sphincter, its course is towards the surface in the middle line posteriorly, or slightly to the right or left of that line. When it passes by the side of the rectum deeper than the inferior hemorrhoidal artery of the same side, it points under the skin in front of and somewhat outside the anal orifice. When the pointing is situated in this position, i. e., in front of the transverse anal line, it might reasonably be assumed, from what we have said above, that the internal opening

would be found on the right anterior or left anterior side of
the rectum exactly opposite the place of pointing. But in
such a case, the fact that the first noticeable sign of the fistula
is an escape of pus from the rectum, proves it to be a blind
internal fistula and should at once prompt a digital examina-
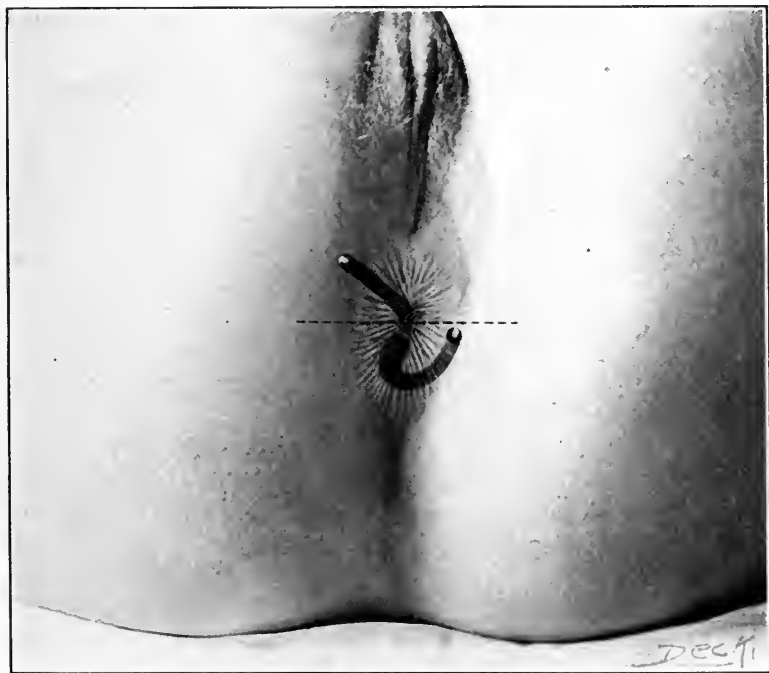tion with the object of discovering the exact position of the

Fig. 39. Schematic illustration of the course of superficial fistulæ.

internal opening. Should the internal opening be found in
the middle line posteriorly, there will be no difficulty in trac-
ing the thickening which always exists in such cases, as it
passes from the internal opening round the lower part of the
rectum to the place of pointing. By following this simple
procedure the mistake may be avoided, while operating, of
making an artificial internal opening, and so leaving the

greater part of the main tract of the fistula, together with the internal opening, untouched. In those cases of blind internal fistulæ which are confined to the submucous tissue, the main tract is directed either obliquely or vertically upwards for a distance varying from one inch to two inches or more above the internal opening."

In view of the fact that a fistulous tract seldom is straight or retains an even caliber through its entire course, an injection of some form of a staining fluid is of great assistance. Methylene blue, permanganate of potash and numerous other coloring fluids are used. Bismuth paste is also used for the recognition of the fistulous tract. Lynch, of New York, recommends a mixture of peroxide of hydrogen and a saturated solution of methylene blue as a means of diagnosis and claims it has proved of great value in very complicated fistulous tracts and where the communication between two fistulæ is so narrow as to make it impossible for the passage of a probe. The peroxide of hydrogen is supposed to carry the methylene blue into the ramifications of the tract and the methylene blue stains the part.

Prognosis. The prognosis as to the cure or amelioration of symptoms presented by patients suffering with fistulæ is dependent upon the pathological nature of the disease, the constitutional condition and the amount of tissue involved. There is no doubt, but that some cases of fistulæ spontaneously cure themselves. The recto-urethral fistula will often heal up by washing out the bladder or by the use of a catheter, relieving in this manner the irritation and infection from the urine. The question of operation on cases of general tuberculosis, in addition to the fistula, is very often a hard question to decide as to the ultimate benefit to the patient. Whether opening these fistulous tracts, in such subjects, permits a copious invasion of the system with the tubercular bacilli as the result of the cutting away of nature's barrier, or that it might be due to the shock dependent upon surgical interference, is hard to ascertain. But the fact remains substantiated by the experience of surgeons in general that these cases are often

made worse by opening up a fistulous tract, so that it comes down to the individual judgment of the operator, in many of these cases, as to the advisability of such treatment. As a rule, a tubercular fistulous tract that is small, with but few lateral burrowings which are not very extensive, and those
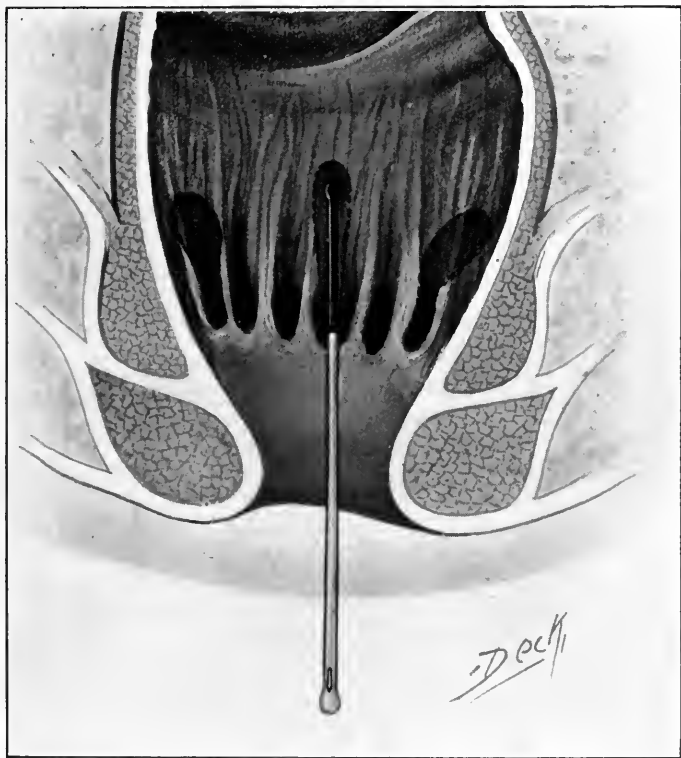

Fig. 40. Submucous fistulæ arising from valves of Morgagni.

that are superficial (subcutaneous) which might be extensive, can be operated on with the best results.

Non-operative Treatment. Non-operative treatment, which is also classified as conservative treatment, is generally applied to cases of fistulæ that are simple, superficial and of the external incomplete type. One can readily understand

that this form of treatment is not free from pain or disagreeable operative measures, such as the injection of solutions, or from the pain excited through the handling of the diseased tissue. Furthermore, this form of treatment does not mean that there is no cutting, but does include, as a non-operative measure, the slight cutting to permit drainage. Nitrate of
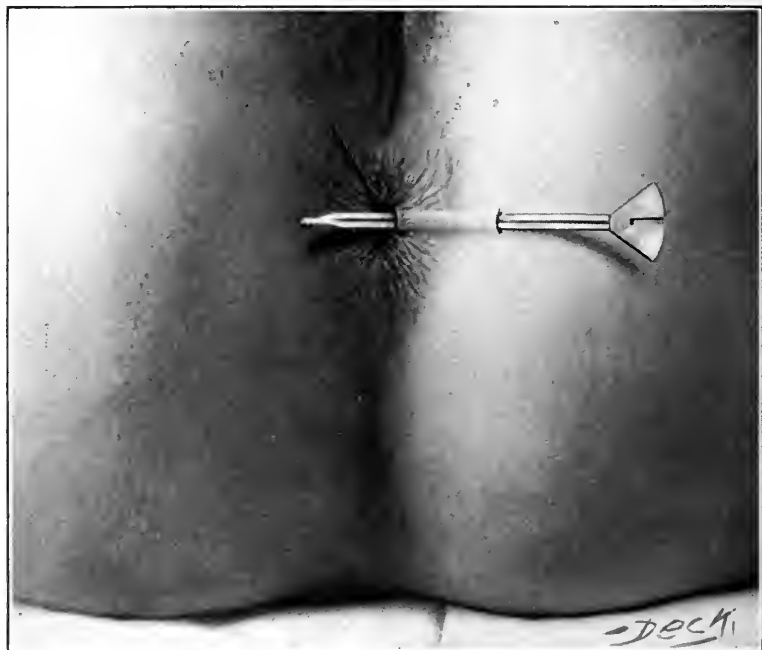
Fig. 41. Showing correct method for incision of fistulæ. The external sphincter is cut straight across its fibers.

silver, in the form of a saturated solution, or a combination of equal parts of tincture of iodine and carbolic acid, or a solution of bichloride of mercury, are the solutions generally accepted as best for the injection in these cases.

The exact knowledge that the tract does not have any opening into the rectum, or any lateral burrowings, is most essential when giving a prognosis. Care should be taken to avoid

the complications which may arise from the escape of the cauterants into the rectum. Injections of this nature are probably safer after the patency of the tract is assured by the injection of peroxide of hydrogen and the saturated solution of methylene blue, or a weak creolin solution, or even cow's
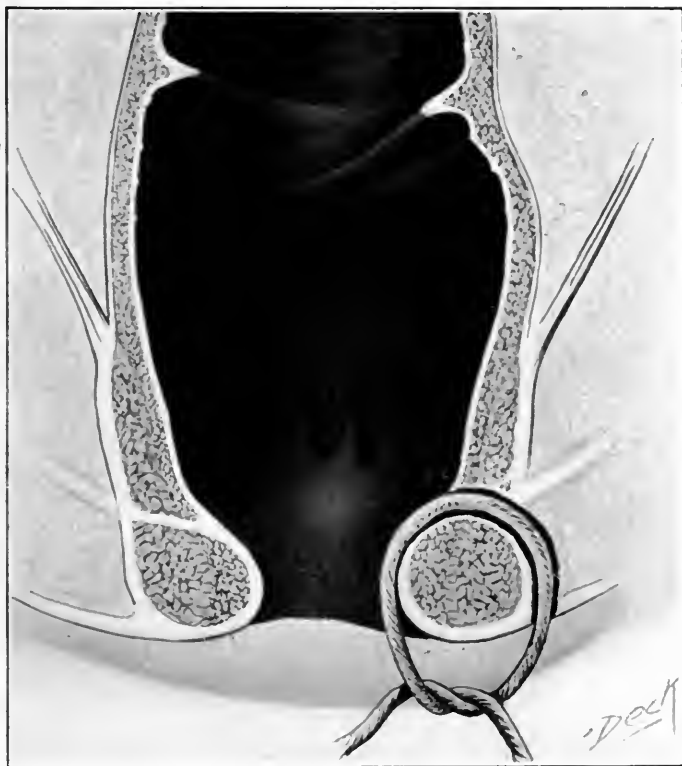
Fig. 42. Elastic ligature in position.

milk, which may be readily detected should it escape into the rectum. A hollow probe attached to the ordinary hypodermic syringe has been found a most useful instrument for the purpose.

The Elastic Ligature or silk ligature which has been used since the time of Celsus, is applicable for the non-operative

treatment of the complete fistula or when a fistula of the incomplete type has been made complete. The rubber ligature is preferable to the silk, because it makes a more uniform pressure. It is introduced after being threaded on an ordinary probe which has an eye, or by means of the Allingham elastic ligature carrier which carries the ligature from the inside to the outside of the rectum. A solid India rubber ligature one-twelfth to one-eighth of an inch in thickness is generally used. After being drawn taut the ends are secured from retraction by a lead shot — a piece of lead with a slit in it.

The ligature operation can be performed without an anesthetic because of the very slight pain, and it allows the patient to go about his ordinary duties. There is no bleeding and no cutting with the knife. It is particularly well adapted to cases of hemophilia or bleeders, and this is really its only field of usefulness. The ligature takes from five to fourteen days to cut its way through; but should the sinus have lateral burrowings, it will be a failure. In some instances it has been found necessary to use the knife after all and it seems, as previously mentioned, that the only field of usefulness of this operation is where a slow process of pressure necrosis is desired to avoid the loss of blood, as in cases of anemia, phthisis and hemophilia.

Electricity and the Ecraseur are generally accepted as undeserving of consideration on account of the pain and the uncertainty of treating the fistulous tract properly, which very often results in protracted convalescence.

The blind external fistula can very often be successfully treated by cutting the external orifice sufficiently to allow free drainage, followed by a slight curettement and the cauterization of the tract with a fifty per cent. solution of nitrate of silver. The administration of nitrous oxide for the preliminary cutting may be used, according to the judgment of the operator.

Operative Treatment. Under the heading of operative treatment the surgical procedures used generally for the different types of fistulæ are considered. As a rule, fistulæ are

best operated upon as early as possible after the establishment of the fistulous tract, and when the abscess cavity does not show a tendency to heal with healthy granulations. The general health at such a time is not materially affected, and the danger of septic complications are not made greater by early measures.

In tuberculosis, when the patient's condition is such as to give evidence of extreme weakness or of low vitality, palliative treatment is best instituted instead of more radical operative interference, and, in some instances it is best to omit any surgical treatment. In tuberculous tracts, the granulation tissue inside of the fistulous tract holds the tubercular bacilli. The bacilli are prevented from entering the body by a strong, thick wall of connective tissue on the inner side of the granulation tissue. If this wall which is provided by nature, is cut through by the surgeon or broken down, the tubercular bacilli immediately find their way into the general circulation, and if the vitality of the subject is low a general tuberculous infection takes place. This theory of Hartman's explains the rapid destruction of tubercular patients after operation for fistulæ, particularly when the subject already suffers from a mild tuberculosis of the lungs and an additional burden is thrown upon his vitality by the opening of a tuberculous fistula or abscess. In order to prevent the escape of tubercular bacilli into the circulation it is best to seal up the cut surfaces by burning out the fistulous tract, using the actual cautery with the idea of destroying these germs and to prevent their absorption.

The treatment and cure of fistulæ in general is considered by surgeons as a task in which their ingenuity and patience will be often greatly taxed.

Fistulatome. This ingenuous instrument, invented by Dr. Mathews of Louisville, Kentucky, is recommended by him in selected cases for the treatment of fistulæ. It is simply a long probe with a small knife, the end of which cuts through the tissue as it is withdrawn, in that way freshening up and helping to stimulate healthy granulation,

Excision. Ball's operation for excision with a suture of a fistulous tract which includes a small amount of the surrounding tissue, has been in vogue for many years. Success with this method has been the good fortune of but few, and as a consequence it has received a condemnation of the profession at large. It seems that the failures have mostly resulted from not thoroughly understanding the technique necessary. It will prove most successful in the external complete variety, which must be straight and not too deep to ensure the proper sterilization of the tract and to permit the complete encircling of the wound with sutures. Total excision and incision of the fistulous tract are nearly similar in their results, if primary union does not take place after the excision operation. Ball recommends that the tract be thoroughly curetted and then cauterized with pure carbolic acid or a strong solution of bichloride of mercury. A sufficient quantity of carbolic acid should be put into the fistulous tract to thoroughly sterilize it in the judgment of the operator. The quantity should not be so large as to permit it to run outside the wound, thereby destroying the adjacent tissue, and should be neatly applied. One should remember that the carbolic acid should not be neutralized but left in the wound, as the success of the operation is almost entirely dependent upon this one point in the technique. The wound should be closed by means of interrupted sutures, about one-fourth inch apart, beginning at the rectal end, and including if possible, a piece of the mucous membrane which should be pulled down over the wound at this point of the first suture. The subsequent sutures can be placed at equal distances throughout the length of the wound, as found necessary. A dry dressing powder of aristol, stearate of zinc, or oxide of zinc may be dusted on, and sterile dressing applied in the usual manner.

Excision with Immediate Suture is almost exclusively applied to those cases of small fistulous tracts of the complete external variety which are short and straight in their course. A long pliable silver probe should be introduced through the entire canal. It may then be used as a tractor when coiled

upon itself. The tractor thus formed should permit the lifting of the fistula and surrounding tissue from the level of the skin. The operator may then cut beneath and around the fistula so as to remove it entirely from its former bed. A small piece of mucous membrane should be dissected loose

Fig. 43. Excision of fistula, first step.

from the rectum and pulled down to cover the rectal end of the wound. Two separate sutures should be inserted at each corner of this mucous membrane flap to hold it in a position to cover the wound sutures. This is done to prevent infection from the rectum. Several tiers of plain catgut, either

continuous or mattrass, sutures should be introduced within
the interior of the wound so as to close it tightly. If nec-
essary, the divided ends of the sphincter should be first
brought together by two or three interrupted catgut sutures.
The skin should not be penetrated during the operation, as

Fig. 44. Excision of fistula, second step.

infection is very likely to follow, due to the inability to
render it sterile. The wound should then be sealed with
iodoform-collodion to add further protection against infection.

Anesthetics. Before operating on the minor cases of fis-
tulæ the question as to whether the patient should receive a

general anesthetic, or whether local anesthesia may suffice, is to be considered. Cocaine is the time worn drug for this field of operation, and when used in a total quantity not over one-fourth of a grain has proven a safe and painless local anesthetic. Eucaine is next in the order of experience and

Fig. 45. Excision of fistula. Method of introducing sutures.

usefulness and is most extensively used by some for this class of work. Quinine and urea hydrochloride has recently been introduced into the field of rectal anesthesia and promises to prove a superior drug for its absolute non-toxic effects, and for the complete anesthesia which it affords. My experience has been with solutions varying from one to five per

cent. I have found it very effectual. The only drawback to quinine and urea hydrochloride is that the anesthesia is not produced as rapidly as in the administration of cocaine or eucaine. The disagreeable shock, symptoms and pain following the use of cocaine and eucaine are most fortunately not apparent after the use of quinine and urea hydrochloride. This is probably due to the effect of the anesthesia of the latter lasting for so many hours after the operation.

Local anesthesia is the only means by which one may operate on those subjects suffering from heart, kidney or lung diseases, which prohibit the use of a general anesthetic. Further, some persons who are unable to spare the time from business or other occupations, or who object to general anesthesia, can only be treated by such methods. When the fistula is short or superficial they can be successfully treated at home or in the office. The use of liquid air has been suggested and it would seem a very satisfactory agent for this purpose. The ether spray, ethyl chloride, or other freezing agents are attended with considerable pain before and after the effect of the drug has worn off, and are not recommended when other agents can be used.

In the division of a fistulous tract which involves the cutting of the external sphincter muscle, whether it be a complete or incomplete fistula, care should be taken in each instance that when the incision is carried through the muscle it is made at right angles and not obliquely. The same general principle should be adhered to, if possible, when tranversing the gluteal region, in severing the levator ani for a fistulous tract, or, when giving vent to an abscess formation. The idea suggested is for the purpose of preserving the muscular plane so that when granulations take place there is a firm regular scar to take the place of the tissue and also that the muscle bands are not irregularly severed as might be with the oblique incision, thereby avoiding incontinence.

Treatment for Complete Fistula. After the rectum has been washed out and the parts sterilized as well as can be done in this region, a grooved director is introduced into the outer

opening and passed through the fistulous tract into the rectum. Care should be exercised that the inner opening has been found, the director not permitted to penetrate the surrounding tissue, and an inner opening made which did not exist before. This may be guarded against by the finger in the rectum acting as a guide. Then, with a knife or a scissors, the entire overlying tissue resting upon the director is divided at right angles to the muscle, avoiding if possible a cut of the zig-zag form, or an oblique incision.

Some authors advocate what is known as Salmons' backcut, which is an incision carried backward from the bed of the fistula. This is supposed to help the subsequent granulations but does not meet the approval of most surgeons, as it is unnecessary. A curettement, with a sharp curette, should be thoroughly and effectively done through all the tract. After this the wound should be sterilized with alcohol, if the tract is not sutured immediately. Loose packing should be introduced to control hemorrhage, a morphine suppository and a drainage tube inserted; then a sterile dressing applied. Should the incision have been so extensive as to leave a large wound, adhesive plaster may be applied over the dressing to keep it secure.

When lateral sinuses are discovered in this variety of fistulæ, the lateral branches should be divided up to the main channel and a single cut made through the sphincter muscle.

When the fistulous tract, or the remains of the abscess cavity, appears to extend higher than the external sphincter muscle, Goodsall and Miles recommend that this portion of the tract be left uncut, the lower section made wide enough for free drainage and the portion behind the internal sphincter forced to granulate by the use of a fifty per cent. solution of nitrate of silver introduced on a cotton stick. In other cases where the lateral tracts are tortuous, and long, it is necessary sometimes to divide a portion of the sinus by inserting the director or probe as far as possible and cutting the overlying tissue, then reintroduce the director until the entire tract is divided. There are many specially constructed directors and

scissors made for this purpose, but the success of the operation is dependent upon the ability of determining the true course of the fistulous tract.

Excision or division with the immediate suture of a complete fistula is well worth the attempt and if the entire tract, on account of the lateral burrowings, seems unfavorable for immediate suture, sometimes the lateral tracts may be sutured at once, and the main sinus left open for granulations. In this way, much time can be saved in the subsequent healing which can do no harm in the attempt, because, if the wound is watched and infection is evident, one can immediately cut out the sutures and allow granulations in the ordinary way.

Complete External Fistulæ usually require very simple treatment. In some instances the introduction of the director through the sinus, and incision over its course, is sufficient to institute permanent healing.

Complete Internal Fistulæ are much more difficult to operate upon because the fistulous tract is very often tortuous and may have more than one lateral branch, as well illustrated in the Y-shaped submucous blind internal fistula. This class of cases should be treated on the same plan as the blind external, as free drainage and a provision for subsequent treatment is secured by converting them into the complete type. A light packing of gauze should be inserted into the wound to prevent the tissue healing over and to arrest hemorrhage.

The Incomplete Internal Fistulæ. The incomplete internal fistula is sometimes very hard to find, but fortunately they are mostly of the submucous type. A speculum is as a rule necessary for those high up in the rectum. They should be converted into the complete type and incised through the entire tract. If possible, avoid cutting the internal sphincter muscle.

Incomplete External Fistulæ. The blind external fistula is best operated upon by inserting the director into the fistulous tract as far as possible and then forcing it through the rectum. This procedure makes it a complete fistula in order to ensure free drainage and to facilitate after-treatment.

General After-treatment should begin two days subsequent to the operation. An attempt to keep the wound as clean as possible should be made by the use of an abundance of mild antiseptic solutions or hot water. Tincture of iodine should be introduced on a cotton stick or toothpick and the wound swabbed with it every second day. It is an antiseptic and mild, effective stimulant. The finger should be intro-

Fig. 46. Horseshoe fistula, diagrammatic.

duced into these wounds as far as possible for the purpose of breaking up all adhesions which are not strong enough to withstand the pressure. This will prevent the formation of a new fistulous tract by the bridging over of the tissue.

Horseshoe Fistulæ are probably the most difficult of the common fistulæ to treat successfully, and owing to the irregularities of the sites and openings of the tracts, the technique will vary with the individual case. A general principle for

operation should be to cut all the communicating sinus up to the main tract, then pass the director into the rectum and make one division of the sphincter muscle at that point.

Complicated Fistulæ. When there are a number of openings, both in the rectum and externally, it is sometimes necessary to cut the sphincter in more than one place. Incontinence is very likely to follow this operation, but there are exceptions to this rule. In those cases which do not suffer from incontinence as the result of loss of sphincteric control, there seems to be a disturbance of the nerve supply which is nearly as bad.

Recto-vaginal Fistulæ are claimed by the gynecologist as part of his field of operation and from their anatomical relations might justly be so, but many of these cases are most successfully treated when a knowledge of the rectal origin form a part of the plan of treatment. This type of fistulæ most commonly originates from an abscess of the anterior rectal wall, the result of an ulceration due to the presence of either a proctitis, malignant, or non-malignant growth, or from pressure during a tedious labor. They may be the result of a burrowing from a pelvic abscess. The diagnosis of either of these conditions will greatly modify the treatment. The fistulous tract may be short, straight or of some length and tortuous when due to the burrowing of an abscess. When a fistula is caused by pressure during the second stage of labor there is a loss of tissue in the recto-vaginal septum and as a result the vaginal opening will be found within three inches of the fourchette.

Treatment. The treatment of this type of fistulæ is dependent upon the cause, position and size of the openings. Should the opening be short, direct, and not too large, the result of a ruptured perineum, the application of the solid stick of nitrate of silver to the entire tract will usually prove successful. The rectum and vagina should be kept well cleaned during the treatments. If due to an ulceration, the result of a stricture, the gradual dilatation of the stricture and permitting free exit of the flatus through the rectal tube,

will suffice in many instances for a cure without further treatment.

Should the opening be large, the best results follow when the fistulous tract is dissected out and the rectal and vaginal surfaces united by separate tiers of sutures. This operation necessitates an attempt at primary union which so often fails in this region of the body. Care should be taken to have the parts thoroughly clean by emptying the intestinal canal, a day or two in advance of the operation; after which two cleansing enemas should be followed by an injection of eight ounces of peroxide of hydrogen, which is allowed to remain in the bowel.

A bivalve rectal speculum should be introduced and the margin of the rectal wall dissected free, removing as little tissue as possible. The circumference of the rectal wall is then separated from the vaginal wall for a distance of about one-fourth of an inch. The aperture in the rectal wall is then closed vertically. Silk gut is used for suturing and the sutures should pass through the entire rectal wall and be placed about a quarter of an inch from the margin. These sutures should be close enough to invert the mucous membrane toward the vaginal wall and hold it in apposition to the inverted vaginal wall. Beyond the angles, additional sutures should be placed at a distance of a quarter of an inch to protect the wound.

Before and after approximation of the wound, it is well to swab the whole area with pure iodine to ensure asepsis, if within the range of possibility. The vaginal portion is cleansed and sutured in the same manner as described for the rectal part of the operation. A rectal tube is introduced and kept in the rectum for three days, but should be taken out each day, cleaned and reinserted. Before the bowels are allowed to move olive oil should be injected into the rectum in order to secure a soft and easy stool. In a week the sutures should be removed, although the vaginal suture may be left for two weeks if unirritating.

Lauenstein's Operation for recto-vaginal fistulæ is as fol-

lows: The fistulous tract is denuded to the rectal mucous membrane from the vaginal surface. Sutures are then introduced from the vaginal side through all the tissue, including the recto-vaginal, excepting the rectal mucous membrane, and the entire wound closed by interrupted wire sutures. Care should be taken that the sutures are introduced so as to bring the parts into a position without too much tension, the direction in which the wound is drawn together being of no consequence. Make no effort to close the opening into the rectal mucous membrane. The sphincters should be dilated and a rectal tube introduced and the patient constipated for a period of four or five days.

Perineorrhaphy. Complete excision of the fistulous tract may be combined with perineorrhaphy. It is an operation which is a modification of that for the repair of the sphincter and is attended with success where aseptic measures can be instituted, but the experience of many has been, that, should it fail, the patient is really worse off after the operation. A modification of this technique, employed by Tuttle, has proved a success by bringing down a piece of the mucous membrane, and attaching it to the anal margin, thus preventing direct infection from the rectal contents. The perineum is then brought together with three or four deep silver wire sutures after the technique of Emmet. The technique as given by Tuttle is as follows:

" The sphincter muscle should be thoroughly but gently stretched; the perineum is then completely incised from the vagina into the rectum up to, but not including the fistula. A probe is then passed through the fistula and the latter together with all its cicatricial tissue is dissected out en masse. The mucous membrane of the rectum is trimmed off from the edges of the wound for about one-half an inch up to the level of the fistulous opening, and above this it is loosened from its attachments until it can be brought down to the margin of the anus. The perineal septum is then brought together down to and including the sphincter muscle with a continuous chromicized catgut suture. Three or four deep

silver wire sutures are then passed through the perineum after the manner of Emmet. Before the latter are fastened the mucous flap in the rectum is brought down and sutured to the skin at the margin of the anus. The wire sutures are then drawn together and made fast by twisting or by perforated shot, and finally the edges of the mucous membrane in the vagina are sutured with plain catgut and sealed over with iodoformized collodion." The operation consists in doing practically a Whitehead operation upon the anterior wall of the rectum combined with a complete perineorrhaphy.

Recto-vesical Fistulæ. This communication is more frequently met with than the recto-urethral fistula. The opening is most commonly at the trigone of the bladder, on account of the close relation with the rectum and bladder at that point, and seems to be simply a perforation, the result of ulceration or traumatism. Other causes are pelvi-rectal abscess, malignant disease, tuberculosis, and non-specific ulceration of the rectum.

Treatment. Much can be accomplished by the use of a permanent catheter and rectal tube in order to empty the bladder and rectum to prevent further irritation or infection. This method has proved successful in a number of cases.

Should this happy result not follow, the sphincters should be stretched by means of a rectal speculum, the margin of the fistulous opening vivified and deep sutures placed carefully so as not to include the bladder wall. The sutures should extend well beyond the extremities of the wound. After this, the catheter and rectal tubes should be introduced as suggested above. Care should be taken to remove the catheter at the end of twenty-four hours, to avoid over-irritation of the bladder. Afterward, it may be passed at short intervals to keep the bladder empty.

Recto-labial. In the treatment of recto-labial cases care should be exercised to avoid the sacrifice of the perineum. Ordinary incision, as practiced on simple fistulæ of the rectum, may prove of serious consequence when the perineal body is weakened as a result of carrying out this treatment of these

cases. Experience has taught me that when the external opening is near or above the sphincter vaginæ, an incision carried parallel with the muscle bands to the center of the perineum and then carried down through that body to the rectal opening will make a triangular opening, with the base toward the rectum, and the apex at the vagina. This incision will preserve the muscular tissue to a fair degree. It has been my good fortune in a few cases to secure a primary union after suturing in that portion of the wound involving the vaginal muscles, intentionally leaving the incision through the perineum open to heal by subsequent granulations. When there is more than one external opening, the ingenuity of the operator will be severely taxed, but he should be governed by the effort to avoid destruction of the perineum.

Recto-urethral Fistulæ are seldom met with by the rectal specialist, and reports of such cases are most frequently made by our genito-urinary confrères. They occur most frequently at the site of contact with the prostate and just below the prostatic urethra.

Treatment. There are many operations suggested for the relief of this condition without success attendant upon them. Sir Henry Thompson recommends that the patient be catheterized whenever there is a desire to empty the bladder and also just prior to movement of the bowels. This serves two purposes, first that it dilates the stricture and secondly it prevents to a certain extent irritation and lateral burrowing. He recommends the use of nitrate of silver, chloride of zinc, iodine and the galvano-cautery with the idea of stimulating granulations to close the wound. This treatment seems applicable only to acute cases, as those of long standing and surrounded by hard cicatricial tissue are apt to be made larger, or result in a stricture of the urethra. Where the opening is very large and feces escapes into the urethra, causing great suffering, an artificial anus should be provided for when less radical measures have failed to give relief. It may be possible to cure the fistula after the fecal current has been changed in this manner by an effort at plastic surgery.

Tuttle recommends a most successful plastic operation for this type of fistula, and as his results have proved most satisfactory, it seems well to give his operation in detail.

" The patient was prepared for treatment by clearing out the intestinal canal, sterilization of the urinary tract through the administration of boric acid and salol and daily irrigations of the urethra and bladder.

" The rectum was then incised in the middle line anteriorly, the cut being carried through into the urethra and extended from the scrotal junction of the perineum into the fistulous opening, thus dividing the urethral stricture. The cicatricial tissue around the entire fistula was trimmed away with the scissors. The intestinal wall was then dissected from its anterior attachments for three-fourths of an inch above the fistula and one-half an inch to each side, a flap was then dissected from the soft tissues on either side of the urethra large enough to replace that portion of the floor of this organ which had been destroyed. A steel sound No. 30 French was introduced into the bladder and these flaps sutured together over it at a slight tension. Secondary flaps were taken outside of the first flaps and entirely surrounding them making a sort of cuff to the first area sutured. The edges of the rectal wall were sewed together in all their thickness with chromicized catgut down to the external sphincter muscle at which point the mucous membrane was dissected loose for a short distance to each side and drawn together by stitches which did not involve the muscle. The incision into the urethra from just below the site of the fistulous opening was left unsutured. A No. 12 soft-rubber catheter introduced through the meatus into the bladder was fastened there by adhesive straps attached to the head of the penis. The anterior portion of the perineal incision was loosely packed with absorbent gauze and a large drainage tube introduced into the rectum to facilitate the escape of gas. The catheter seems to cause the patient no inconvenience and it was left in position for eighteen days, the bladder and perineal wound being irrigated daily with Thiersch's solution."

CHAPTER XIII

FISSURE IN ANO

ANAL fissure is technically a small ulcer, the result of a crack or elongated break in the mucous membrane at the anal orifice. The ulceration is of a character distinct in itself, not so destructive or so extensive as the ulcer found higher up in the rectum. The prefix, anal, distinguishes this ulcer from the rectal ulcer. Fissure in ano exists almost entirely within the folds of the mucous membrane covering the external sphincter, and is a most painful and distressing affliction in comparison with the rectal ulcer, which is situated above both sphincters and attended with little or no pain. An anal fissure is a small, more or less superficial ulcer, just within the margin of the anus and involves or extends from the bottom of one of the rugæ formed by the contraction of the external sphincter muscle. The ulcer is usually triangular in form and extends upward into the longitudinal axis of the anal canal for the distance of one-half inch. The apex is generally found, on inspection, at the lower margin of the internal sphincter, and the ulcer varies in depth in different cases. In some the ulceration involves only the mucous membrane, while in others the submucous tissue, or, in those of long standing, the muscle fibers of the external sphincter can be seen and form the floor of the fissure. When the external sphincter contracts, the lateral borders overlap the floor of the fissure and must be drawn apart to view its full extent. Sometimes, there is found a small fold of skin at the lower border of the fissure, or to one side of it, which is called the *sentinel pile*. The position of the ulcer may be at any point in the circumference of the anal canal, but as a rule is found in the median line or to the right or left of it, posteriorly.

The chief characteristic of a fissure is its extreme sensitiveness, the slightest touch causing intense pain with spasm of the sphincters and levatores ani muscle. The skin and mucous membrane is most sensitive. The pain will vary in character from the extreme superficial pain at the muco-

Fig. 47. Ordinary position of lateral fissure.

cutaneous junction to an almost constant ache referred to the tip of the coccyx associated with the deep ulcer. Fissure in ano is found at all ages from infancy to old age.

Causes. Catarrhal proctitis is probably the commonest of all causes of fissure in ano, especially when associated with constipation. Besides this, anal fissure may be caused by

congenital narrowing of the anal orifice, eczema, polypi, diarrhea, syphilis, or by any cause which interferes with the normal elasticity of the mucous membrane or the submucous tissue of the anal canal. An anal fissure is primarily due to a tearing of the mucous membrane.

Fissure may also result from overdistention of the vagina and tearing of the anal tissue in parturition.

Symptoms. The most important symptom is pain, sometimes associated with dysuria and frequent urination, the latter more often associated with the anterior fissure. There may be blood or pus in the fecal mass. The pain is probably due to the exposure of the nerve ends as in any fresh cut surface, which, if left uncured, excites a chronic local neuritis. The presence of blood and pus in the fecal mass, with the subjective symptoms of pain occurring after the stool for a period varying from one-half to two hours, is almost a positive sign of a split or fissure in the mucous membrane of the anal orifice.

Treatment. Treatment of the anal ulcer or fissure may be either palliative or operative and cases should be treated selectively. The treatment of a recent tear is very simple, while the deep chronic fissure, with hypertrophy of the sphincters, is very difficult. It is wise to try palliative treatment in all cases for two to three weeks and at the end of that time, if a marked improvement has not occurred, operative treatment should be instituted. It is well in these cases to thoroughly explain to the sufferer in advance the proposed method of treatment, emphasizing that palliative treatment cannot be considered certain although worthy of a fair trial.

Operative treatment is indicated when the fissure is complicated by other rectal diseases; when the ulcer is deep and exposes the muscle fibers of the external sphincter; or when the edges are thick and the sphincters hypertrophied.

Palliative treatment consists of the application of local remedies, the relief of constipation, the catarrhal condition and local cleanliness, but depends largely upon the duration of the fissure. Many have been quickly relieved by mild as-

tringent applications such as hamamelis, while in others the solid stick of nitrate of silver, or pure ichthyol, has failed to procure the desired results. Ordinarily, the longer the fissure has existed, the more we have to stimulate, with due consideration for the patient, as the anal margin is probably the most sensitive part of the body. Balsam of Peru, ni-
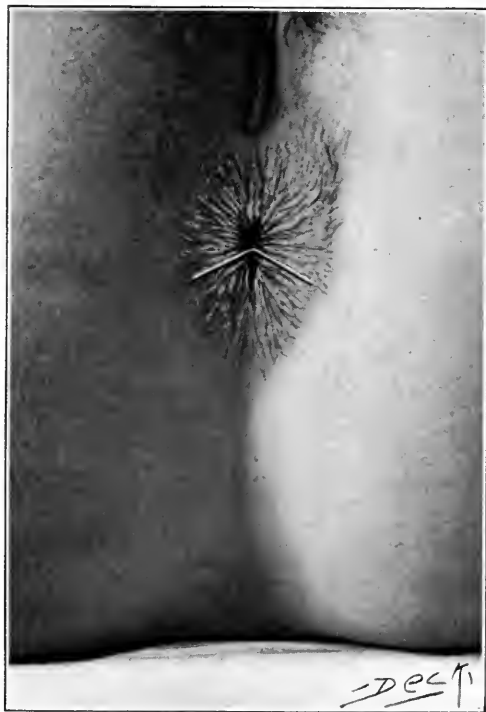
Fig. 48. Fissure in ano. Bilateral incision.

trate of silver and pure ichthyol are in my judgment the best remedies for the palliative treatment of the chronic indurated ulcer. Pure ichthyol has given me more uniform satisfaction, as compared with the others, when applied every second day, after an insufflation of orthoform or the topical application of a cocaine solution to relieve pain. Along with this treat-

ment, local cleanliness, the normal control of the bowels and rest in bed should be insisted upon, if possible. In treating the constipation, one must always bear in mind that a catarrhal condition usually exists and therefore the resinous bearing cathartics, which irritate the rectum and anal canal should be avoided.

Cauterization is recommended by some surgeons in almost all cases of fissure in ano which have not yielded to cleansing and stimulating treatment. Cauterization is usually done under a general anesthetic, but often local anesthesia is considered sufficient, although the latter is usually confined to the use of the chemical cauterants — silver, nitric acid, carbolic acid, liquor potassa, or copper sulphate. The use of the Paquelin cautery point is almost exclusively applied under general anesthesia; only one cauterization is as a rule sufficient, but in persistent cases it may be necessary to repeat the procedure two or more times. It is well, when a general anesthetic is used, to dilate the anal ring at the time the cauterization is made. However, cauterization with the severe chemical cauterants and the actual cautery has not proved a success in my experience, and, while healing has occurred, a certain degree of pain has often been complained of by the patient for a long period afterward. This pain was attributed by me to a certain amount of deep-seated nerve injury, or to a scar of undue hardness.

Surgical treatment consists of dilatation, excision, and division.

Dilatation, or stretching of the anal orifice by forcible or gradual means, has been in vogue for many years, especially among the French surgeons. Both of these methods have for their object the breaking up of the continuity of the muscle fibers or nerve strands, thereby relieving the muscular spasm. Dilatation is very painful under local anesthesia and one has only to try to dilate the anal canal of one of these sufferers to condemn the method, as the hypodermic injection is terrifying to them. Dilatation under general anesthesia

is practiced commonly by surgeons and the results are most satisfactory. The anal dilators used generally are the hard rubber, wax, the Wales hollow graduated soft rubber bougies and the Kelly conical dilator. These dilators are used either with local anesthesia or often without any form of anesthesia. However, forcible divulsion with the index fingers or thumbs is the most popular method of dilating, but should be
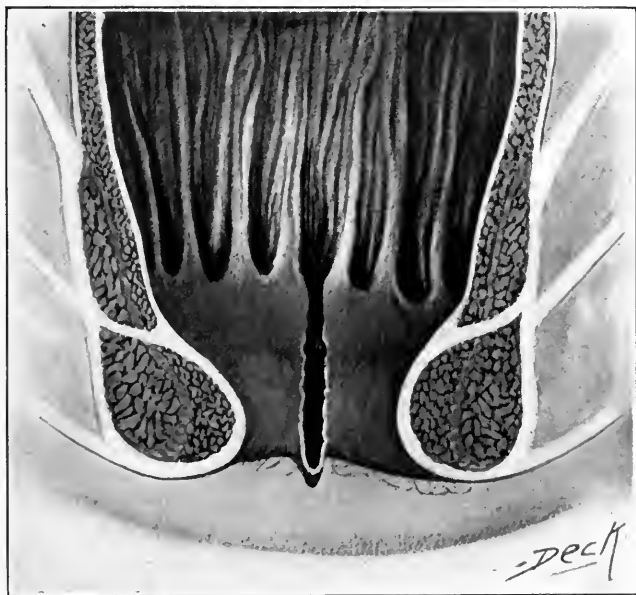
Fig. 49. Tear in crypt of Morgagni producing fissure.

accomplished only under a general anesthetic. Dilatation by any means is intended to over-stretch or rupture the sphincter muscles, thereby preventing their contraction, which is supposed to permit the healing of the ulcerated surface. To contradict this idea it is a well-known fact that the muscle regains its contractile power within a few hours or days, so that the relief is very temporary in most instances. Sometimes the extreme dilatation causes permanent incontinence. Healing

will often follow dilating by any of these procedures, if a tube is left in the canal for from five to seven days afterwards.

This method of treatment is not certain, as a splitting of the muscular fibers may happen at any point in the circumference of the anal ring, which adds a traumatism to the previous pathological injury. Incision or excision are preferable on account of the definite area cut with the knife.

Excision consists of making an elliptical incision which circumscribes the fissure, permitting its entire removal. The wound may then be permitted to heal by granulation, or closed at once with catgut sutures. The latter method, however, is open to objection on account of the liability to infection under the sutures.

Incision. The extent of incision of the external sphincter for the relief of a fissure has been discussed for many years and seems not to have been settled yet. Each author advocates his or another's method, all of which vary as to the degree of incision, so that it appears to make little difference which method is used, if the surgeon limits his incision to the external sphincter only. The object and result must be the severance of the muscular fibers which act upon the diseased area. The incision can, therefore, be one which completely severs the muscle or that only penetrates it beyond these fibers, setting it at rest. The incision thus made should be through the ulcer, and can be applied to a fissure at any point in the circumference of the anal canal.

The incision for the posterior fissure which appeals to me and has proved most successful, is the bilateral, made on each side directly transverse to the sphincter fibers, and a little deeper and longer than the ulcer. This double incision puts at rest both sides of the muscle fibers over which the ulcer is situated.

Post-operative treatment of these cases consists in the application of tincture of iodine and stimulating with an ichthyol solution or balsam of Peru, applied either with the cotton applicator or on a piece of gauze inserted into the wound every

day. Pure ichthyol or a five to ten per cent. solution of nitrate of silver may be necessary in severe cases.

Finally, if we consider that the fissure is secondary to a catarrhal inflammation of the rectum, irrigation of the rectum is indicated every second day, as suggested for colitis. To bear out this theory, cases which were irrigated with a twenty per cent. solution of krameria have healed nicely when combined with local treatment, without operation. These cases were not of the mild type and indicated incision for their relief from the surgical standpoint. There is no doubt in my mind that a healthy healing of the majority of fissures will follow correction of the digestive disturbances and the catarrhal inflammations of the colon or rectum in this manner. A hypertrophic or atrophic catarrhal inflammation of the colon, sigmoid or rectum is in almost every instance the primary factor in its causation. The mucous discharge accompanying these diseases irritates the anal canal and interferes with the healthy granulation of an otherwise insignificant tear in the mucous membrane.

CHAPTER XIV

ABSCESSES

Ischio-rectal abscess or peri-proctitis are the terms commonly designated to mean the collection of pus or suppuration in the region about the anus and the lower segment of the rectum. This inflammation may be circumscribed or diffuse. The pus extends or burrows along the lines of least resistance and is held between the planes of fasciæ and blood vessels which are able to resist dissolution. An abscess which is not incised, as a rule extends until it reaches either the skin, mucous or serous surface, through which it may discharge itself. In this manner, a collection of pus in the ischio-rectal fossa will find its way along the anterior fascia of the levator ani and discharge itself between the internal and external sphincters into the rectum. An abscess may discharge itself through the skin and rectal wall, forming a complete fistula. Thus it is to be seen that a fistula necessarily begins as an abscess, simple in its onset, but may burrow and rupture at different points, causing a complicated fistulous tract. Abscesses in this region are necessarily forced to pursue a definite course which is changed by the relations of the original site of the abscess cavity to the surrounding planes of tissue and blood vessels.

The abscesses found in this region are divided into superficial and deep, dependent in most instances upon the division made by the levatores ani muscles. In addition, we may have abscesses which have their origin in the urethra, Bartholin's glands, prostate gland, or the bony structure about the pelvis, which burrow into the ischio-rectal fossa.

Classification. The anal, ischio-rectal, retro-rectal, and su-

perior pelvi-rectal abscesses are all phases of infection found in this region.

The anal, including *tegementary* abscesses, are a result of an infection of the follicles, the same in every respect as the furuncle found in any portion of the body. The *sub-tege-mentary* is a lymphangitis and is simply infection carried through the lymphatics. The *ischio-rectal,* as their name denotes, are confined to the ischio-rectal fossa, or peri-rectal space. They originate ordinarily through the lymphatics.

Etiology. Infection may occur through either the lymphatics or the blood current carrying infectious bacteria from surrounding tissue; or locally from ulcers, fissures, thrombotic internal piles, tears of the mucous membrane or from degenerated growths in the rectum. Males seem to be more subject to rectal abscess formation, particularly at the age of thirty. Persons who have a constitutional condition in which the resisting power and vitality are lowered, either from acute diseases or from the prolonged ravages of chronic diseases, are probably the most frequent sufferers. Influenza and tuberculosis are no doubt the most frequent precursors of this disease, due to their depressing influences permitting invasion of the peri-rectal space with the intestinal bacteria. The bacteriæ are the *communis coli, streptococcus pyogenes, staphylococcus pyogenes,* and *tubercular bacilli,* which may be found singly or in multiple varieties in these abscesses. We may have specific infection due to erysipelas, typhoid, syphilis, or tuberculosis. The deep abscess is generally of the phlegmonous type, but may become gangrenous, with necrosis and diffuse sloughing of the surrounding tissue.

Superficial Cutaneous Abscesses found in the skin are due to infection of the follicles near the anal outlet and are identical with the furuncle or acne abscess found in other portions of the body. The subcutaneous and submucous abscess are due in almost all instances to infection as the result of a lesion in the anal canal or rectum. The infection is carried through either the lymphatics or blood vessels into the cellular

tissue, causing a circumscribed inflammation and later an abscess.

The Ischio-rectal Fossa forms an easily invaded region because the fat and deficient blood supply render its resisting power extremely low and when infection is carried within its tissue the result is a very quick abscess formation. In fact, the resisting power of the fatty tissue is so low that the tendency is, as a rule, to involve the entire cavity. Fortunately this fossa is mostly hemmed in on all sides by strong resistant tissue in the form of fasciæ and muscles, which impede extension. The barrier to rupture into the rectum is incomplete, however, at the interval between the internal and external sphincter muscles, the most common point of exit for abscesses discharging into the rectum. The lateral extension of pus to the opposite side of the rectum is also made possible by the weak point at the junction of the levatores ani and the upper surface of the anococcygeal ligament. The weakness against rupture of the abscess into the rectum at this point in the barrier is supposed to be due to prolonged straining during defecation, particularly in the median line posteriorly, as the attachment of the anococcygeal ligament to the external sphincter muscle and the incomplete attachment of the levatores ani muscles form a most fixed point; here straining weakens and attenuates the tissue. This weakness permits easy access to the fossa and when we consider the frequent occurrence of trauma from straining and the subsequent formation of a fissure it is no surprise to so often find the opening of a fistula at this point of vulnerability. An abscess will sometimes burrow down through the separation between the superficial and deep fibers of the external sphincter, at the point where the longitudinal muscle fibers of the rectum pass through it to the skin. Many abscesses follow the course of these fibers and form a complete fistula.

Pus may completely surround the lower part of the rectum in this manner, discharging posteriorly in the middle line, after an invasion of both sides at the weak point formed at the junction of the levator ani and the ano-coccygeal liga-

ment. In the diagnosis of the different forms of disease in
this region the excellent division of the anal region by Good-
sall and Miles has been of great aid and is well worthy of a
thorough understanding in the treatment of rectal diseases.
The description of this scheme as given in their text is as
follows:
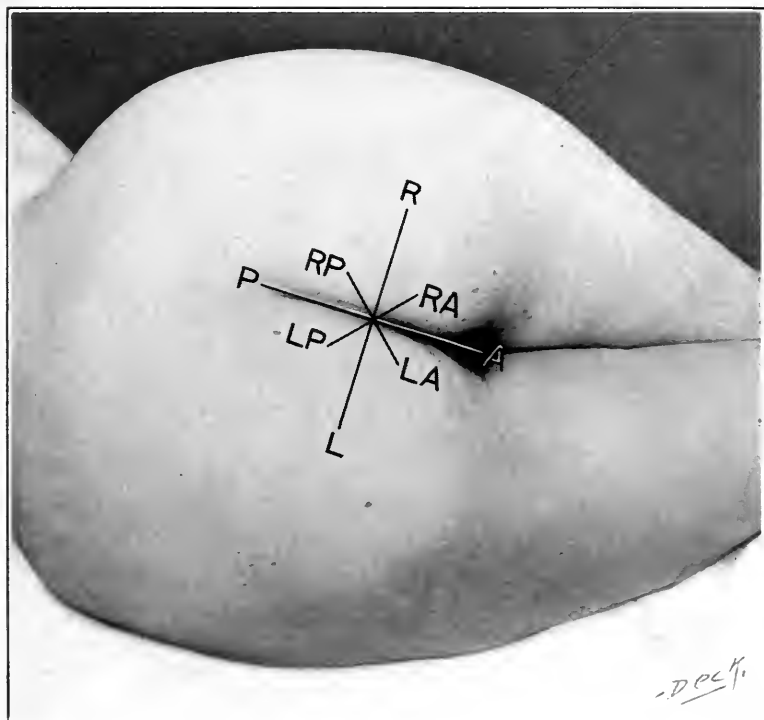
Fig. 50. Subdivision of perineal space (schematic).

" For convenience in describing the exact position of dis-
eased conditions in relation to the anal margin and rectal
wall, we have adopted the scheme of subdividing the perineal
space into quadrants by two imaginary straight lines inter-
secting at right angles in the center of the anal aperture.
The first line is drawn from the most prominent part of one

tuber ischii to the other. This line we have termed the transverse anal line and by it the anal ring is divided into an anterior and a posterior half. When dealing with the various diseases met with in the rectum and anus, we shall endeavor to show that this line is of much clinical importance. The second line runs along the median raphe from the tip of the coccyx to the symphysis pubis and intersects the transverse line at its center. We have designated the extremities of these lines by the letters, A, L, P, and R, representing respectively the anterior, left posterior and right points of the circumference of the ano-rectal region.

" Each of the quadrants is again bisected by two additional lines drawn at right angles to each other and intersecting the point of section of the lines AP and RL. The extremities of these lines are designated by the LA, LP, RP and RA, representing the left anterior, the left posterior, the right posterior and the right anterior quadrants.

" By adopting this scheme, the exact position of the disease can be definitely indicated. Thus an internal pile situated in the right anterior quadrant of the rectum can be briefly described, as the RA internal pile and similarly the external opening of a fistula situated posterior to the transverse line to the right side and distant from the anal margin say one inch may be readily described thus — external opening RP, one inch. This abbreviated and concise method of description is applicable to all other forms of disease met with in this region.

" Abscesses which start in the ischio-rectal fossa, anteriorly to the transverse anal line, are more superficial in their course than those starting posteriorly to that line. In these, the pus reaches the subcutaneous tissue at the outer margin of the external sphincter muscle and then extends forward beneath the skin towards and along the cruro-scrotal or cruro-labial fold. At the same time burrowing takes place in an outward and backward direction, usually, superficial to the inferior hemorrhoidal artery. The pus reaches the rectum between the internal and external sphincters at a point situated mid-

way between the transverse anal line and the anterior margin of the anus, on the side on which the abscess exists. The internal opening may be situated at a point corresponding to the interval between the sphincters, but sometimes it may be quite an inch or even more above this point in consequence of the burrowing having extended upwards beneath the mucous membrane before bursting into the rectum. In such cases the burrowing may also extend even higher than this opening, a pocket being formed beyond it. Occasionally, the forward burrowing passes subcutaneously in front of the anus to the opposite side, thus forming a subcutaneous anterior horseshoe fistula."

Symptoms. The general symptoms are the sudden onset of the formation of pus, as occurs with ordinary abscesses. This may be marked by chills, rise in temperature, quickened pulse and pain, varying in degree according to the location and extent of tissue involved. The follicular abscess being so superficial, is marked by hardly more than itching, redness and discomfort in sitting. The ischio-rectal abscess is often attended with retention of urine and a feeling of weight in the rectum. When these abscesses burst into the rectum all the symptoms improve. Should the abscess cavity refill all the symptoms recur with the exception of the retention of urine. Often a history will be elicited which covers repeated refilling of such abscesses at periods for years.

Treatment. Many of these abscesses of subcutaneous variety yield readily to the application of carbolic acid, neutralized with alcohol. Should the abscess have burrowed, or originated in the subcutaneous tissue, it is much more satisfactorily incised under local anesthesia, in the form of ether spray, liquid air, ethyl chloride, cocaine, eucaine or quinine and urea hydrochloride. The incision should be of the T-shape, with top of the T toward the anal opening to ensure free drainage and to permit granulation from the bottom of the wound.

Submucous Abscesses require, as a rule, dilatation of the sphincters and therefore necessitate the use of a general anes-

thetic. Incision should be carefully made through the entire length of the abscess, parallel with the long axis of the rectum, in order to avoid the later accumulation of pus in a poorly drained pocket. A submucous abscess of the Y-

Fig. 51. Rectal abscesses. A, ischio-rectal abscess; B, submucous abscess.

shape, situated posteriorly and extending beyond a complete fistula, is of quite common occurrence and remaining undetected results in a failure to cure. When the burrowing has extended for a distance more than three inches up the rectum,

care should be exercised to avoid penetrating the peritoneal cavity. Bleeding after primary incision of these abscesses is usually quite free and often requires firm packing.

Ischio-rectal Abscesses require free incision to drain the cavity, as well as to make a wide-open wound. The T-shaped incision is recommended for this purpose. The wound should be irrigated, curetted and entirely emptied of pus and necrotic tissue. The cavity should be cauterized with carbolic acid or tincture of iodine. Should carbolic acid be used, it is well to neutralize with alcohol, if the abscess cavity is very large, to avoid the poisonous effects of the acid; then pack the wound with gauze for two days. These sinuses are best treated without packing subsequently.

The Pelvi-rectal Abscess has its origin in the loose connective tissue existing between the levatores ani and the peritoneum above, in what is known as the superior pelvi-rectal space.

Retro-rectal Abscess. This variety of abscess forms in the space between the sacrum and the rectum, in the superior pelvi-rectal space, posteriorly.

The connective tissue of the pelvi-rectal space is part of the common connective tissue of the meso-rectum in the male and female — of the broad ligaments in the female and of that covering the prostate gland and neck of the bladder in the male.

Infection may have been carried through the lymphatics or the blood supply from adjacent pelvic disease, rectal operations, or sepsis during the puerperium. The pus is liable to pass downward, penetrating the fibers of the levatores ani at the junction of the levatores ani and external sphincter, posteriorly, forming an ischio-rectal abscess also. These abscesses are always serious, the prognosis is variable and dependent on the true seat of origin. A diffuse cellulitis is extremely dangerous to life as peritonitis is most easily induced should the pus burrow into the general peritoneal cavity. A deep anterior horseshoe fistula, recto-urethral fistula, or the posterior horseshoe fistula may result. The posterior

horseshoe fistula follows the pelvi-rectal abscess much more frequently, however.

Symptoms. The symptoms are masked by the complicating disease and appear suddenly. The invasion may be acute
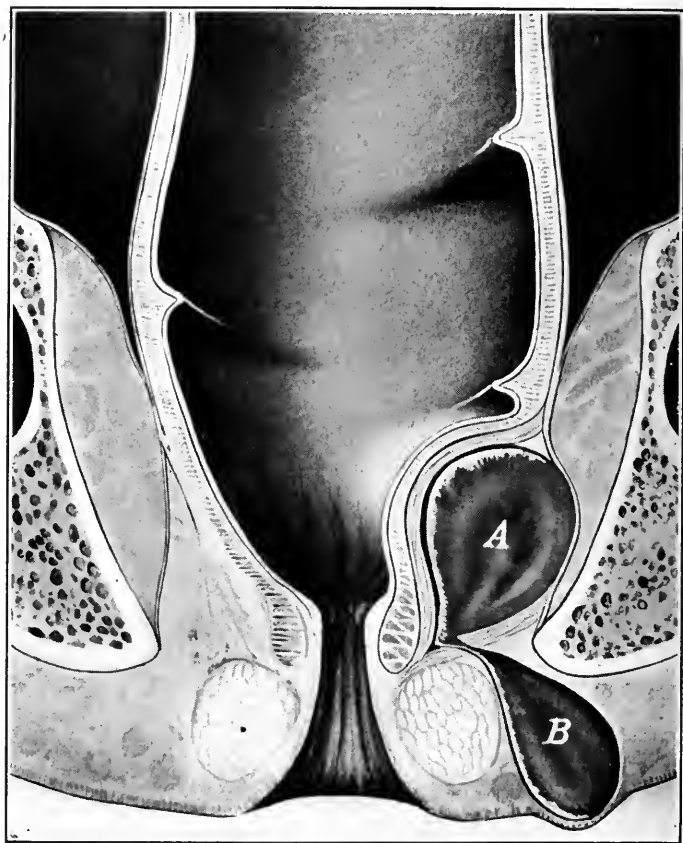
Fig. 52. Rectal abscesses. A, pelvi-rectal abscess; B, terminating in ischio-rectal abscess.

or extending over a period of time largely associated with the existing disease.

Treatment. When the abscess points into the ischio-rectal fossa the treatment is the same as for one originating in that

region. Free exit for the pus will greatly ameliorate the symptoms due to the disease itself. The further treatment is mostly directed to the origin of infection and may require the vaginal incision of a pelvic abscess or, in a very exceptional number of cases, abdominal section. When this incision is carried high up through the levator ani muscle, the wound should be tightly packed for a few days to avoid hemorrhage. The incision should not be carried through the internal sphincter, otherwise incontinence will follow.

The After-treatment of incised abscess cavities is sometimes most important, as the incision may be the most radical and best method of treatment for the immediate relief from pain and suffering in general, but will not insure the patient from the discomfort and misery of a protracted fistula discharging itself from the former site of infection in the pelvic or ischio-rectal region. Therefore more failures or resultant fistulous tracts may be attributed to the lack of knowledge on the part of the surgeon, or to his inability to impress upon the patient the great necessity of after-treatment. To avoid such a result persistent treatments should be carried on at short intervals — every other day — until the fistulous tract is entirely healed. Ordinarily a pelvic-rectal or deep ischio-rectal abscess will require eight to ten weeks of treatment to bring about a successful termination. Nitrate of silver in from 5 to 20 per cent. solution will be found most useful in the healing of these tracts, after thorough irrigation of the wound with a 5 to 10 per cent. solution of tincture of iodine. To stimulate granulations ichthyol or balsam of Peru is preferred by some surgeons, but the nitrate of silver will be found the safest to guard against a tubercular invasion in those cases which manifest the disease locally in the form of one of these abscesses.

Often we are negligent in not submitting for examination the pus from an abscess in this region, particularly in an individual not suspected of tuberculous infection. It has been my misfortune to find many such unsuspected cases were tubercular on later examination and I have been well pleased

to have treated them with nitrate of silver as a routine protective agent. The silver salts undoubtedly tend to destroy the tubercle bacilli and do so without an extensive destruction of the underlying tissue, thus leaving the barrier Nature has previously thrown around the abscess and fistulous tract to protect the patient against further infection.

The wound should be thoroughly dilated with the finger prior to the treatment, in order to break down adhesions at the sides which leave areas higher up unhealed. In other words the granulating process must be permitted to advance only at the bottom of the wound so as to prevent the formation of a fistulous tract which might be covered by the healthier granulating surfaces near the skin.

CHAPTER XV

STRICTURE OF THE RECTUM

THE term stricture of the rectum is used to indicate a constriction or narrowing of the lumen at any portion of the anal canal or rectum. This definition is intended to include a narrowing at the muco-cutaneous junction and the entire length of the rectum.

Strictures occur in different forms dependent upon the cause and duration. They are classified as *Annular,* which is simply a ring-like encircling of the rectum, or may be of the *Tubular* form which encircles the rectum for several inches, or the *Complete* form in which the entire bowel is occluded. The most frequent site at which stricture is found is from one to three and a half inches above the anal opening, the majority being situated at the point where the levator ani muscles encircle the intestine.

The rectum is considered the most frequent site for stricture as compared with any other outlet of the body. This is caused by the anatomical and physiological functions of the part, which is constantly subjected to catarrhal and bacteriologic infection. Women are more commonly affected with stricture than men, probably due to the adjacent organs being subject to disease and malpositions.

Causes. Strictures of the rectum may be classified as follows according to the causes: 1. Malignant. 2. Congenital. 3. Traumatic, due to operation. 4. Venereal. 5. Catarrhal. 6. Tubercular. 7. Ulceration. 8. Spasmodic. 9. Hypertrophy of Houston's valves. 10. Pressure due to adjacent organs or tumors. 11. Acute inflammations.

Malignant Growths have been in my experience the most common causes of stricture of the rectum and the general

practitioner should anticipate the frequency of this disease, which is, in the majority of cases, manifested by the discharge of blood. Hemorrhoids are almost always present and may be the only complaint of the patient. An examination of the rectum will reveal the stricture. Often malignant growths are permitted to go on to disintegration before they are recognized as cancer, the common belief being that a non-malignant
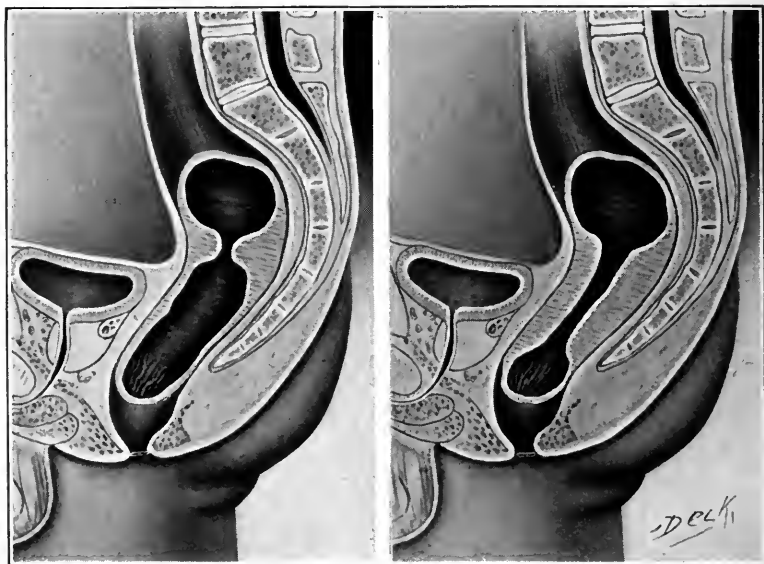
Fig. 53. Annular stricture of rectum.   Fig. 54. Tubular stricture of rectum.

ulceration is more common. Ulceration with stricture occurring in persons from thirty-five to sixty years of age had better be considered malignant on the first impression than otherwise. The microscope is certain to prove the character of the tissue and afford a safe indication for subsequent treatment.

Congenital Strictures have been considered under the chapter on malformations and need not be repeated here further than to state that congenital narrowing of the anal outlet is

commonly unobserved during a whole lifetime. The child or adult seldom complains until symptoms of constipation and difficulty in expelling the fecal matter cause apprehension of a narrowing at the anal or rectal outlet. In some patients the toleration of the condition is extreme and they only seek relief after the mucous membrane has become bruised or torn from the fecal mass, consequently we often find them suffering from painful fissures, ulcers or hemorrhoids.

These strictures are characterized by a fibrous band about one-half or three-fourths of an inch above the anal margin. It may consist of a well-defined band, or an annular fold with the opening in the center or to one side. The sphincter muscle is distinct from the band and is sometimes hypertrophied. These bands in some cases after puberty are so dense and inelastic that it is impossible to dilate them with the ordinary rectal bougie, or even the more powerful instruments, without tearing into the surrounding tissue. It may be necessary to cut the fibrous tissue in order to give any temporary or permanent relief.

Strictures from malformations of lesser degree give excellent response to gradual dilatation after several small incisions have been made in the circumference. Forcible dilatations to the extent of tearing the stricture is to be condemned. The tear from a powerful instrument is apt to cause more damage to the adjacent tissue than is intended, is indefinite, and no idea of the traumatism caused by such methods of treatment can be foreseen.

Traumatic stricture occurs as the result of operative procedure within the rectum or for hemorrhoids. Surgeons who operate by either the ligature or clamp and cautery methods too often remove so much of the redundant tissue that when subsequent contraction occurs a stricture at the anal opening is almost inevitable. Infection and inflammation following either of these operations are commonly the cause of stricture.

Venereal strictures are due, in the majority of cases, to syphilitic infection occurring during the primary and tertiary stages. During the early stages stricture probably results

from a syphilitic proctitis. During the secondary and tertiary stages stricture is due to the involvement of the submucous tissue and blood vessels, or the infiltrations of the surrounding tissue from ulceration. The disease is recognized from the history and the microscopic finding of the bacillus spirocheta pallida. Gonorrhea seldom results in stricture and then only in neglected and ignorant individuals. In these cases, stricture is probably due to the inflammatory process, which thickens the gut wall, or to ulceration and necrosis.

Chancroid ulceration may leave sufficient scar tissue to cause constriction of the bowel, when low down or in very protracted and neglected cases. Stricture due to this cause is also of infrequent occurrence.

Catarrhal inflammation, due to proctitis, may follow inflammatory deposits, ulceration, follicular inflammation, secondary ulceration, from severe irritations, from corrosive substances, or as the result of traumatism in the form of prolapse of the rectum.

Tubercular constriction, sufficient to cause stricture, is of rare occurrence. Usually an ulceration due to tuberculosis has a tendency to spread and at the same time not heal sufficiently to cause a stenosis. The diagnosis should be made by examination of the tissue and for the possible presence of infection in some other portion of the body.

Stricture of this pathological nature seldom exists by itself and there is usually an abscess or pocket of broken-down tubercular tissue from which a fistulous tract will ramify into the neighboring tissue or encircle part of the rectum. Therefore, the general symptoms of tuberculosis, with temperature, hectic flush, and debility, are present with those strictures which assume proportions sufficient to give symptoms of obstructions. Tubercular ulcer may be present by itself in the rectum, but causes none of the symptoms ascribed to stricture.

Ulceration of the rectum may be due to secondary hypertrophic catarrhal proctitis, kidney, heart or lung diseases; to diabetes, follicular proctitis, cancer, tuberculosis, syphilis, chan-

croids, traumatisms or dysentery, any of which may cause stricture.

Spasmodic or phantom stricture of the rectum is a condition which is probably not a reality. The condition described in my opinion is the contraction of the valve of O'Beirne, at the junction of the rectum and sigmoid. This spasm or apparent stricture is a common observation to those making use of the proctoscope or sigmoidoscope and may be observed at one time in the same patient and at another time may be undiscernible.

The Hypertrophy of Houston's valves. This condition arises from hypertrophic catarrhal inflammations, ulcerations, specific diseases, and any of the inflammatory processes which increase the fibrous tissue or interfere with the normal elasticity of these valves. A stricture due to a hypertrophy of these valves is produced by the overdeveloped valves overlapping one another so as to produce a complete or partial occlusion of the lumen of the rectum.

Pressure due to adjacent organs. Pressure may be produced by a retroverted uterus, by tumors of the prostate, fallopian tubes, bladder, vagina, ovaries, or the sacrum.

Acute inflammations following operations upon the uterus or its adnexa in which a pelvic abscess burrows down into the pouch of Douglas and invades the rectal wall, sometimes produces stricture. These strictures after a very severe cellulitis or a peritonitis in this region may cause from one to three strictures at different portions of the rectum or sigmoid.

Simple inflammatory stricture may follow abrasions or inflammations of the rectal mucous membrane which extend into and involve the submucosa. A fibrous infiltration and formation of a stricture to a greater or less degree may result after an injury to the mucous membrane from either of these causes, even after the primary lesion disappears. A diffuse inflammation may exist which involves the submucosa. This character of inflammation may extend from a blind internal fistula into the surrounding submucous tissue and may be so extensive

as to narrow the lumen of the rectum while not involving the mucous membrane. These simple inflammatory strictures seem to depend upon the extension into the submucous tissue which does not involve the mucous membrane, and explains why the more superficial catarrhal ulcerations seldom result in a narrowing of the lumen of the rectum.

Symptoms. The general symptoms of stricture are dependent upon the primary lesion which has resulted in this condition, also upon the form of the ulceration, the discharge of blood, pain, temperature, and the insufficient evacuation of the bowels contents. These again will vary with the location of the stricture, as strictures situated high in the rectal cavity are apt to give the symptoms of chronic constipation, with very little pain unless the result of an acute inflammation. When the stricture is situated in the anal canal the symptoms are more or less exaggerated, due to the more sensitive condition of the parts, the narrowness of the canal at this point and the involvement of the sphincters in the effort to expel the bowel contents.

As a rule, the heaviness and weight in the rectal and sacral regions produce a disturbance of the urinary apparatus. The apparent constipation becomes alarming as the difficulty in emptying the bowels increases. Ulceration and irritation, due to the distention and accumulation of the fecal matter occurs. The interference with the circulation from compression of the blood vessel produces a pressure necrosis. This often is attended with the copious discharge of thin, mucopurulent matter and a frequent desire to defecate, resulting in straining and the passage of mucus and blood. This condition is apt to mislead one and if the diagnosis as given by the patient is accepted the trouble will be mistaken for diarrhea, as almost invariably patients presume that they are suffering from a diarrhea.

The symptoms of fecal impaction are often pronounced, although a diarrhea may exist which is made worse by the administration of opium or other drugs for its treatment. A digital examination of cases of protracted diarrhea which are

associated with the feeling of fullness and heaviness in the sacral region should never be neglected. The character and amount of the discharge is largely dependent upon the nature of the stricture.

Syphilitic stricture is associated with a very abundant, dark, bloody discharge which may irritate the sphincters to such a degree as to make the condition almost unbearable. In syphilitic stricture, inflamed tags of skin with condylomata and papillomata frequently surround the anal opening.

Tubercular stricture is associated ordinarily with a creamy white discharge which is seldom mixed with blood.

The molded character of the stool in stricture does not give us any reliable symptoms of the disease and should not be considered in any sense as an indication of stricture, because as a rule, the stools are modified only by the strictures which are situated in the anal canal. Strictures which involve the sphincters infiltrate the muscle fibers and interfere with their action which gives rise to more or less incontinence.

As a result of the thinning out of the walls of the rectum or sigmoid above the narrowing of the rectal canal from a stricture we may have ulceration and rupture of the bowel which emphasizes the danger of this condition.

Diagnosis. Digital examination for the diagnosis of this condition is again emphasized as the only positive means of discovering a stricture within reach of the finger. When high up, the use of the pneumatic proctoscope combined with the symptoms elicited from the patient will be sufficient. Sometimes it is necessary to place patients under a general anesthetic and by bi-manual examination through the vagina and the abdomen above, search for the stricture during the period of general relaxation. In all of these examinations gentleness should be exercised in order to avoid the danger of rupturing the diseased bowel above or below the stricture, or around the diseased tissue.

The symptoms and diagnosis of stricture in the majority of cases is dependent upon the causation and the degree of obstruction of the bowel. Patients often imagine they have

stricture when in reality the sphincters are only in constant spasm as the result of a fissure or other painful affection at the anal margin. Stricture may be complicated by the presence of a fistula burrowing from an ulcerated surface in any direction.

Cancerous stricture, which has not undergone apparent ulcerations, may be differentiated as a firm, inelastic, epithelial growth; *inflammatory stricture* will be accompanied by temperature or other constitutional disturbances and will give a history of disease in or about the rectum prior to the formation of the stricture. *Sarcoma* is developed from the underlying connective tissue stroma and assumes the polypoid or rounded ball-like shape, seldom annular in form. *Syphilitic stricture* is more widespread in its growth, being a proliferating process, and does not assume the band-like characteristics of cancer. In some instances however, cancer may involve the mucous membrane by metastasis at several points above or below the stricture, but never so extensively as syphilitic infection during the same period of growth. Cancer may push a portion of the healthy mucous membrane before it and give the impression of a connective tissue tumor (sarcoma), but at some place on its surface the epithelial nature of the growth will be discovered in the form of an ulceration with broken down tissue. A *tubercular stricture* breaks down almost as rapidly as it is formed and cannot constrict the rectum like the hard, firm, inelastic, cancerous tissue.

Treatment. Treatment of stricture in general is largely dependent upon the etiological cause which may be constitutional or local. When due to a specific disease, such as syphilis, treatment for that disease should be instituted in a vigorous manner with the hope of causing absorption. Medication, however, in cases of long standing is very disappointing. Gastric disturbances arise from the imperfect emptying of the bowel independent of the stricture. Where treatment by the various suggested methods is not indicated, liquid fecal movements are an absolute necessity to empty the intestine.

Electrolysis. This mode of treatment has been the sub-

ject of much discussion for many years without giving any
very satisfactory results. It is claimed that electrolysis stimu-
lates the absorption of fibrous tissue. Various forms of elec-
trodes are used for this purpose, the olive form being the one
most used. The positive electrode introduced into the mass
itself has a tendency to harden the tissue while the negative
pole has the reverse effect of dissolving it. My experience
with this method of treatment has been so meager that in view
of the adverse criticisms I have nothing to advise in this
form of treatment.

Gradual dilatation is the only method of treatment that can
be instituted in some of these cases, and is indicated only for
those situated within five inches of the anal opening, below
the level of the peritoneum anteriorly. Above this point
forcible dilatation might inadvertently rupture the rectum
and cause peritonitis.

Stricture of the anal orifice may be dilated with the olive-
shaped bougie which is made in four sizes and may, at this
portion of the gut, be safely used by the patient. Dilatation
between the anal opening and the reflection of the peritoneum
is best done with the Wales soft rectal bougies which are
made in various sizes and twelve inches in length.

Rapid dilatation of the rectum is best done with the knife
as it is an instrument more definite in its lines of severance
of the stricture.

Divulsion, by either gradual or forcible means, is resorted
to more often than any of the other surgical procedures for
stricture for the reason that the knife is not used. Forcible
dilatation, as a rule, is done with the fingers under a general
anesthetic, or bougies, uterine dilators, operating speculæ or
any of the mechanical rectal dilators sold in the shop may be
used. When it is possible, the fingers only should be used.
They are the safest dilators, as a tearing of the mucous mem-
brane or underlying tissue is readily detected. In using the
bougie or dilators without general anesthesia it is seldom
necessary to have the patient retain the instrument for more
than five to ten minutes and this should be done every day

for a week, if the dilatation is gradual. When the dilatation is done under anesthesia, the lumen of the bowel is increased to its greatest diameter without tearing and subsequently treated without an anesthetic with the idea of making the dilatation permanent.

Internal proctotomy is described as a method which aims to incise a stricture within its lumen in various directions as the case demands, but owing to the liability to infection, ulceration and subsequent cicatrization, the method cannot be recommended.

Posterior proctotomy consists in incising the stricture and all the tissue back to the coccyx. The knife is passed through the tissue and on withdrawal the stricture and intervening tissue is cut through, leaving a large triangular incision. Bleeding is arrested by ligatures and temporary packing with gauze. The wound should be irrigated with one to two thousand bichloride solutions and repacked again with iodoform or plain sterile gauze. A rectal suppository containing morphine or opium should be inserted or hypodermic injections of morphine given to relieve pain.

The after-treatment of posterior proctotomy should consist of a daily flushing out of the rectum and every precaution to keep the wound healthy. Tincture of iodine, balsam of Peru, nitrate of silver and naphthaline solutions will be found of great service. During the treatment a large sized bougie should be passed occasionally to prevent the recurrence of the stricture.

Total excision was presented as a most enticing operation for the relief of stricture some years ago, but has proven to be unreliable and subject to sepsis, abscess, fistula and death. The sutures used to unite the bowels are subject to infection and are likely to separate, causing another stricture. The perineal and sacral methods are advocated in performing this operation. The technique is the same as for malignant growths, which may be modified for the special indications.

Bacon's operation for performing a lateral entero-anastomosis has proved a most ingenuous method for the relief of

stricture of the rectum situated above the levator ani muscles.
The operation, as the name indicates, consists in making a
lateral opening between the rectum and a duplication of the
sigmoid flexure below the stricture.

The technique is as follows: The patient is placed in the
Trendelenburg position and an incision made from the um-

Fig. 55.   Stricture of rectum.   Bacon's lateral anastomosis.

bilicus to the pubis, and after entering the abdominal cavity the
sigmoid is folded downward until it reaches below the stric-
ture. This measures the point at which the lateral anastomo-
sis is to be made. This portion of the sigmoid is then brought
up and out of the abdomen and, with Murphy's clamps above
and below the point, a longitudinal incision is made through
the gut between the clamps and the male half of a Mur-

phy button secured in this incision. The peritoneal surfaces of the sigmoid and rectum which are intended to be put into apposition later are scarified and the female portion of the button introduced into the wall of the rectum with the short trocar made for that purpose. This should be accomplished by passing the trocar in the instrument through the hole in the button, then it is pushed up into the rectum by an assistant to the point below the stricture. The operator at the same time presses down upon the trocar from the peritoneal side and forces it to penetrate the wall, carrying the neck of the button with it. The ends of the button are then approximated by the operator and the lateral anastomosis is made complete. A few sutures should be placed in the peritoneal gut of the folded sigmoid to prevent any small loop of the intestine from coming down between the sigmoid and rectum, and also to strengthen the anastomosis. If the operation has been done without any leakage from the rectum or the sigmoid into the abdominal cavity, the abdomen may be closed and primary union looked for. The Murphy button will be expelled in five to eight days. After expulsion of the button, a rectal enema should be given and the colon emptied. Within a few days or as soon as the comfort of the patient will permit a long clamp should be inserted through the rectum and one blade introduced through the button-hole into the sigmoid, while the other extends up the rectum so as to include the stricture. The septum is then completely severed by closing the handles a little tighter each day. By

Fig. 56. Trocar for insertion of female segment of Murphy's button in Bacon's operation for stricture of the rectum.

this procedure the caliber of the gut will be increased to that of the sigmoid flexure.

Colostomy. When stricture of the rectum or lower sigmoid is inoperable by either excision, proctotomy or dilatation a colostomy is resorted to. The establishment of an artificial anus is also resorted to when either of these operations have been done and the stricture recurs, or when symptoms of autointoxication or infection are so pronounced as to threaten life and it becomes imperative to give free vent to the intestinal contents.

Colostomy allows an opportunity of treating the strictured
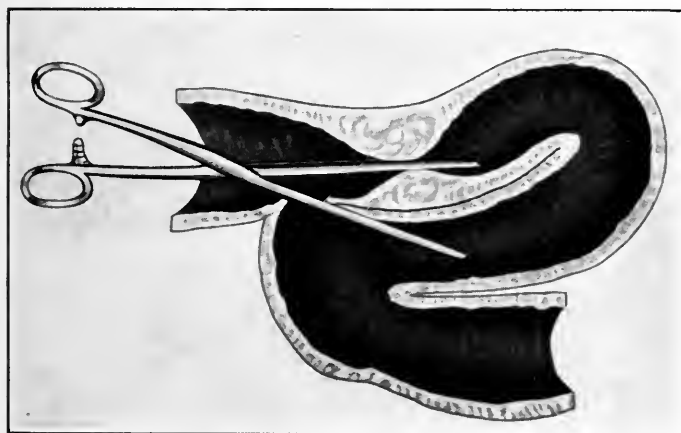
Fig. 57. Bacon's operation—Clamp through anostomotic opening and stricture to widen it by pressure necrosis.

portion of the gut from both sides; allows complete drainage of the intestinal tract; relieves distention, irritation and obstruction to the fecal current; so that the establishment of an artificial anus has many good points when circumstances render the operation necessary. While the operation is condemned by many surgeons, misery and death can often be avoided for a long period by this procedure. The technique of the operation will be found under Chapter IX.

CHAPTER XVI

CONSTIPATION

CONSTIPATION may be defined simply as the slow movement of the digestive residue, or the fecal mass through either the small or large intestines or a relatively insufficient daily evacuation. There is seldom any interference with its progress in any portion of the small intestine because of its liquid condition. As the chyme travels from the duodenum towards the large bowel it gradually becomes more solid until it reaches the cecum, where it is fairly firm and moves slowly.

Experimentations with the X-ray demonstrate that in the average adult the fecal mass reaches the transverse colon within about ten to twelve hours after the ingestion of food, and then takes from sixteen to twenty-four hours longer to reach the sigmoid flexure. The natural receptacle in which the fecal mass rests prior to expulsion is the sigmoid flexure, as is further demonstrated by these experiments. The expulsive act begins, as a rule, with the descent of the mass from the sigmoid to the rectum and it is this movement which is followed later by the desire to defecate soon after the ingestion of food and is probably due to some reflex stimulation from above in the intestine. In normal children, constipation is mostly dependent upon their inability to interpret this physiological sensation when it occurs.

Constipation may be the cause directly of a fissure in ano, hemorrhoids, ulcer, hypertrophic catarrhal proctitis, or erosions, any of which may in turn be the starting point for other disease.

Constipation is so closely associated with rectal and stomach diseases that it almost always forms an integral part of the complex symptomatology and is rather to be expected in the

consideration of all these cases.   Its relation to rectal diseases
bears so strongly upon the ultimate cure or the amelioration
of symptoms, that a knowledge of its causes and treatment,
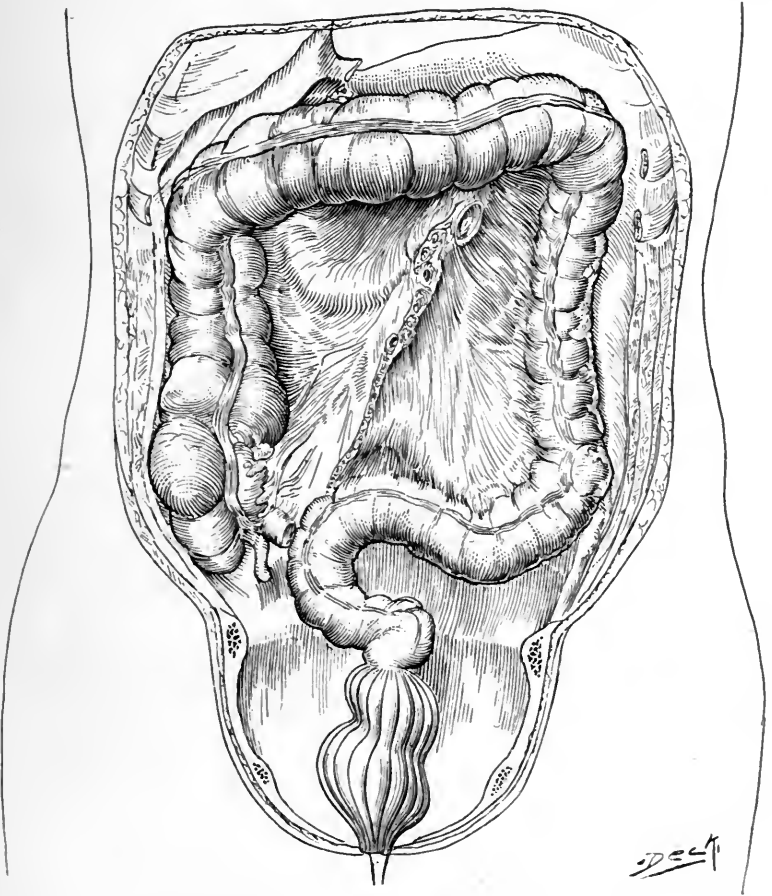
Fig. 58. Diagram of normal large intestine. The position when distended.

based upon the effects of drugs in the sigmoid and rectum, is
absolutely necessary.

This affection is in most instances only a symptom of dis-
ease of the colon, the nervous apparatus, or the result of

habit. It represents a discharge of the digestive residue dependent upon the quantity and character of the food eaten, the time taken to traverse the intestinal canal, and to the power of digestion and assimilation in each individual. Therefore, it should not be applied indiscriminately to every person whose bowels do not move each day. To find the cause of constipation involves frequently the solution of a very complex etiological question, as the systematic and motor nerves undoubtedly often play a large part in its causation. Hypertrophic catarrhal colitis is a disease in which the oversecretion of mucus is sometimes associated with a very obstinate constipation and alternating diarrhea. It is hard to understand why constipation exists during the course of this disease unless due in some way to a nervous disturbance. It can be easily understood why atrophic catarrhal colitis has, as a constant symptom, a protracted constipation owing to the weakness of the atrophied muscular coats. Fecal discharges which are hard and in the form of little balls would indicate the presence of an atrophic catarrhal colitis, or a slight rectal tenesmus. The condition is sometimes induced by the hypertrophy of the sphincter ani muscles or the overgrowth of Houston's valves.

The character of the stools should in all instances form part of the knowledge procured from the patient.

Etiology. Constipation is due to many causes commonly associated with diet faults and habits.

The Motor Activity of the intestine may be lowered as would occur with constitutional disorders and protracted fevers which would for a period be the cause of a disordered nervous system.

Over-distention of the bowel with gas, the result of fermentation, will in some instances stretch and weaken the muscles of the intestine. This condition is undoubtedly a very common beginning of constipation in children.

Deficient Amount of Food. When insufficient food is taken there is not sufficient residue to be evacuated within the ordinary limits of time and an apparent constipation exists.

In others the natural stimulants contained in the food residue are not in sufficient quantity. For example, the proteids in excess will almost invariably bring about constipation. A vegetable diet contains a generous amount of sugar, organic salts, cellulose, acids, fats and other indigestible residue.

Lack of Water. The skin and kidneys during exercise excrete so actively and profusely, particularly during hot weather, that a deficiency in the bodily supply of water may exist. Under these conditions, the deficiency should be compensated by a generous quantity of water. It should be remembered, the contents of the intestinal canal lose a proportionate amount of fluids under such circumstances, which results in a hardness and dryness of the fecal mass.

Over-activity of the Motor Centers is apt to produce constipation alternating with diarrhea, and the condition known as mucous colitis results. These cases resemble in their origin the asthmatic as being the result of a prolonged irritation succeeded by over-activity of the motor nerves.

A Disorder of the Inhibitory Nerves, which are from the sympathetic system, may produce constipation, or it may result from a disease of the motor nerves. The motor nerves are the vagi to the small intestine and the sacral to the colon; hence, constipation may be produced all through the intestine by irritation of the sympathetic nerves alone and produced in the small or large intestine singly, if either the vagi or sacral are diseased.

Entero-spasm (Spastic Constipation) may result from over-activity of the motor nerves supplying either the small or large intestine, producing the well-known symptom of colic.

Congenital Kinking of the Sigmoid, due to its excessive length compared to the other portions of the colon, before the age of five or seven years, may cause a relatively slow movement of the bowel contents, owing to its length, and in addition offer an obstruction at the point of kinking. This congenital condition of the sigmoid is considered by Jacobi as one of the most common causes of constipation in children during this period of life.

Weak Abdominal Muscles. Persons suffering from weak abdominal muscles, the result of diseases which cause muscular atrophy, or that have interfered with a normal growth, have not the power to compress the intestinal contents sufficiently to give the needed aid to expulsion.

Incomplete Membranous Occlusion of the anus and organic stricture of the rectum and anus are malformations, which, while only partly obstructing the rectal and anal canal, may cause constipation.

An Incomplete Invagination of the sigmoid or rectum may be the cause of an insufficient evacuation of the bowel contents, but as it is of such a serious nature it is safer to consider it from a surgical standpoint as an intestinal obstruction. Atresia ani vesicales, atresia ani urethrales, atresia ani vaginalis, atresia ani uterinæ are other malformations which may remain undiscovered for a while causing symptoms of insufficient defecation.   Atresia ani vaginalis is often not discovered until late in life, and it furnishes fully fifty per cent. (50%) of the cases of malformation of the rectum.

Congenital Idiopathic Dilatation of the colon (Hirschsprung's disease) may be the cause of an apparent constipation.   This rare disease begins probably as a congenital deformity, in which there is a dilatation of from three to four inches in width, beginning at about the lower end of the sigmoid flexure and include all or part of the colon; the small intestine not being affected.   The muscular and mucous membrane coats are very much hypertrophied and the meso-colon and peritoneal covering thickened.   The dilatation may be enormous and admit of the collection of a great mass of fecal matter.

Obstruction to the normal movement of the bowel occurs from cancer, stricture, tumors within the bowel and pressure from neighboring organs.

Painful Affections such as fissure in ano, thrombotic piles, prolapse of the rectum, congenital narrowing of the rectum or anus, or a stricture the result of a catarrhal proctitis, may cause obstipation.   Any of these conditions may cause reten-

tion from fear of pain at defecation, and therefore simulate constipation. Fissure in ano is a very common disease, and without doubt one of the frequent causes of constipation or obstipation.

Symptoms. Auto-intoxication is the most common result of constipation. Its many reflex symptoms are in the form of irritability of temper, eye defects, disordered stomach, and a lack of a healthy complexion. We may have more serious manifestations in children in the form of infantile convulsions, night terrors, day terrors, teeth grinding, bed wetting or hypochondriasis due to intestinal disturbances.

Prophylaxis. Children suffering from constipation should be taught at the beginning of the sixth week to move the bowels while on a suitable receptacle. Infants at that age, as a rule, have a bowel movement after the second feeding, and the habit encouraged then will prove of great benefit later. Older children should receive strict observation and be forced to attend to a daily evacuation. Adults, likewise, should be taught to understand that the same principles apply to them.

Treatment. Constipation being a term used to indicate the relative slow movement of the fecal contents, the treatment is necessarily indicated by the symptoms of auto-intoxication, digestive disturbances and anemia which accompany this deficient physiological function. Authentic statistics refute the opinion that a daily evacuation of the bowel contents is necessary to perfect health in all adults, as cases are on record in which individuals have had only weekly movements of the bowels, without interfering with the general health in any way. These facts would direct the treatment to relieving the condition only when constipation has interfered with some of the healthy bodily functions and should be governed by individual treatment.

Enemata and suppositories, consisting wholly or in part of soap, as given children most frequently, are a common cause of proctitis. The daily enema, or suppository of soap, should be condemned. In cases due to a kinking of the sigmoid

flexure, a daily enema is the best method of emptying the bowel, but care should be exercised to have it consist simply of water. In giving an enema for this purpose an ordinary piston syringe should not be used, as the sudden injection of the fluid into the rectum tends to empty it at once, leaving the mass high up unaffected. A small catheter attached to a fountain syringe will gently carry the water into the rectum and allow it to advance into the sigmoid without expulsion. The fountain syringe should not be held higher than a foot or two above the body so as to avoid too much force.

The use of magnesium sulphate and calcined magnesia are very valuable for temporary use in children, when added to the bottle food. Strong purgatives, such as aloes and the mercurial preparations, are so irritating to the mucous membrane of the intestine that their continuous use for constipation should not be encouraged. Castor oil, owing to its after constipating effect, is only harmful in these cases.

The use of the ordinary drugs for constipation, such as cascara, podophylum and senna, are to be recommended as secondary to a general line of treatment relieving the condition if possible, and arising from some definite cause. The combinations of these drugs are so well-known and commonly put up that their special prescription need not be mentioned.

Deficient motor activity is probably dependent upon a constitutional disease and is theoretically classed as such. Persons suffering from febrile diseases for short periods, due to this cause, are best relieved by the well-known and agreeable laxatives. During long periods of illness in which it is fair to presume that the depression due to the disease has caused motor inactivity, a combination of the alkaline laxative treatment with rhubarb, cascara, calomel and muscular tonic treatment is best left to the judgment of the physician in charge.

When constipation is due to hypertrophy of Houston's valves, valvotomy is indicated and may be accomplished with the clips made for that purpose.

Constipation, obstipation and fecal impaction are in many instances due to the same cause and only represent differ-

ent degrees of intestinal incompetency, so that fecal impaction and obstipation are subject later to the general treatment and investigation as applied to constipation.

Entero-spasm (spastic constipation) is probably the symptom of an existing mucous colitis, more common in a mild degree than is accredited. The treatment should be along that line and efforts made to control the catarrhal inflammation which may involve the entire digestive tract. Olive oil and castor oil to regulate the bowels and occasionally belladonna to control the spasm in the intestine, combined with tonics, should be the general treatment of these cases.

As much of the intestinal activity is due to chemical stimulation produced by the digestion and decomposition of food, vegetables are of much more value than meats. Fats and their derivatives, glycerin, fatty acids and soaps, are powerful stimulants. So that in an attempt to remedy a deficient amount of digestive residue necessary to stimulate the normal intestinal peristalsis, the diet is of great importance, as the bolus of undigested material or chemical stimulants are necessary to excite peristalsis. Organic acids, produced in the intestine by the fermentation of the carbohydrates contained in vegetable foods, stimulate peristalsis. Cellulose, of which vegetables consist largely, is also a potent mechanical stimulant of peristalsis, and passes through the intestinal canal without undergoing absorption or decomposition, thus serves this purpose. Fecal matter which accumulates in the colon in small quantities, the result of abnormal assimilation and digestion, in some instances will not produce effective stimulation to peristalsis, and auto-intoxication may follow from the extreme delay in the intestinal canal.

Recent experimental investigations have proved that the cellulose contained in different vegetable matter is not acted upon by either the gastric or intestinal digestive ferments and does not undergo absorption or decomposition. Schmidt and Neville Wood have brought the subject practically and forcibly to the attention of the medical profession by their excellent work in this direction. Schmidt suggests the use of agar-

agar, and both recommend the use of paraffin. In Germany, bread made from wood shavings has been advocated for this purpose. Agar-agar is slightly affected by bacteria, but since it is composed largely of hemi-cellulose it may be readily substituted instead of a large vegetable diet. Agar-agar may be administered in the ordinary dose of one teaspoonful in mashed potatoes or stewed apples. This dose may be increased, if necessary, to half an ounce which should be divided between the different meals. The combination of cascara with agar-agar is sold under the name of regulin. Hertz relates an apparent toxemia due to the administration of agar-agar for the relief of constipation and attributed the toxic effects to the bacterial growth in the agar-agar which forms an excellent culture medium. Liquid paraffin is so disagreeable to the taste that a few drops of some aromatic oil should be mixed with the dose to be taken. The ordinary dose is from one to six drachms a day.

Strychnine acts in a general way upon the peripheral and central nervous system and is particularly indicated in those forms of constipation which are dependent upon a depression of the central and peripheral nervous system. It increases the tone of the muscular coats, probably by a stimulation of Auerbach's plexus, causing a stimulating diet or purgatives to be more effective.

Atrophine decreases excessive peripheral nerve excitability and tends to a regular peristalsis in cases of mucous colitis or entero-spasm. Its value is limited to such cases and it proves of little use in other forms of constipation which are due to different causes. The pain accompanying enterospasm due to lead poisoning, in which there is an irritation of the vagus, is relieved by its effect upon the nerve ends. In these cases atrophine does not assist the evacuation of the bowel so that a purgative should be administered at the same time.

Vegetable purgatives, such as aloes, senna, cascara, and rhubarb, owe their purgative action to an irritation of the motor-nerves from the anthracene compounds which they contain. Aloes take from ten to twelve hours to act upon the

bowels and are considered one of the slowest of the vegetable purgatives. In my experience aloes are a positive irritant to the rectum, and the same may be said of podophyllum, senna, and the resinous bearing purgatives in general. Their use should be avoided if possible when hemorrhoids, fissure, proctitis or any irritation of the rectum, due to other forms of disease, exists.

Cascara sagrada is probably the best drug for constipation when it is necessary to continue medication. It should be combined with strychnine and when used for a long period should be alternately given with aloes, senna, or podophyllum. This drug seemingly irritates the colon and rectum less than any of the other vegetable purgatives excepting rhubarb. Rhubarb, owing to its astringent after effects, should not be used for the relief of constipation.

Castor oil, which is split into glycerine and recinoleic acid by the pancreatic juice, is not indicated in the treatment of constipation, owing to its after constipating effect, excepting when the condition is due to hypertrophic catarrhal colitis, senile constipation and spastic constipation.

Saline Purgatives. The commonly accepted theory of the action of saline purgatives has been proven by the experiments of Hertz to be erroneous. He has found by X-ray investigations that a saline purgative given before a meal reached the cecum, in combination with bismuth oxychloride, in four hours, but the subject had emptied the bowel two and a half hours earlier, supposedly from the purgative. That the purgative had not traveled faster than the bismuth was proven by observations on two patients with fistulæ at the end of the ilium. The greater part of the purgative was found in the stool the next day. The only explanation possible was that the salt had been absorbed from the smaller intestine and acted from the blood on the neuro-muscular apparatus of the colon, producing increased activity of the motor and secretory mechanism. Saline purgatives do not enter the duodenum until they have become isotonic with the body fluids by dilution with the secretion of the gastric mucous membrane. (Hertz.) Absorption then takes place from the duodenum

into the blood. So that the administration of saline purgatives should be recommended before meals, while the stomach is empty, to facilitate its rapid absorption. The analysis of urinary excretions show that about one-half the quantity of saline purgatives are passed off by the kidneys. Salines empty the colon without interfering with digestion in the small intestine or stimulating muscular activity.

The relative values of vegetable foods, as compiled in the following table by Robert Hutchinson and quoted by Hertz, is well worthy of study in the treatment of constipation, when medication has not afforded the desired results. In combination with the vegetable purgatives very excellent results can sometimes be gotten if the bowels are forced to a habitual evacuation after breakfast by injecting about eight ounces of cold water. The water stimulates an immediate movement of the lower bowel which may be followed after a few days' treatment with a regular movement. This cold water treatment is necessary each day for a period of not less than two weeks but may, if needed, be carried on for a longer time at intervals of every other day. In looking over the table of relative cellulose values which the vegetables and fruits contain, spinach is of much importance in the treatment of constipation. The presence of sugar and organic acids which fruits contain should also be added as a necessary complement in diet form of treatment.

Cellulose	Percentage in the uncooked food	Percentage in the dried food
WHEAT.		
Whole Grain	2.6	3
Bran	18	20
Germ	1.8	2
Endosperm	0.7	0.8
BREAD.		
White Bread	0.3	0.5
Whole-meal Bread	1.5	3.0

Cellulose	Percentage in the un-cooked food	Percentage in the dried food
SCOTCH OATMEAL	3.1	3.2
EDIBLE PART OF VEGETABLES		
Haricot Beans	4	5
Beetroot	3	29
Lentils	2	2.3
Asparagus and Onions	2	19
Parsnips and Artichokes	2	10
Turnips and Carrots	1.6	15
Vegetable Marrow	1.3	25
Cauliflower	1.2	13
Rhubarb and Mushrooms	1.1	19
Cabbage and Tomatoes	1.1	15
Broad Beans	1.0	1.1
Spinach, Seakale and Celery	0.9	15
Watercress	0.7	10
French Beans	0.6	6
Potatoes	0.6	3
Cucumbers	0.5	13
Lettuce	0.5	8
Green Peas	0.5	2.5
BOILED PEAS	0.3	0.7
FRUIT		
Bilberries	12.2	48
Dried Walnuts	7.8	8
Raspberries	7.4	48
Dried Figs	7.3	9
Dried Dates	5.5	7
Currants (red, black and white)	4.6	32
Plums	4.3	20
Greengages	4.1	36
Cherries	3.8	23
Peaches	3.4	31
Pears	3.1	20
Gooseberries	2.7	19
Apples	2.7	16
Grapes	2.5	22
Strawberries	2.2	19
Oranges	1.5	13
Melons	1.0	22
Bananas	0.2	0.8

CHAPTER XVII

FECAL IMPACTION AND OBSTIPATION

FECAL IMPACTION indicates the accumulation of fecal matter at some point in the large intestine or rectum which resists the ordinary efforts of expulsion or the effects of laxatives. These accumulations may be of enormous size and hardness which water fails to dissolve and often produce symptoms of intestinal obstruction, although the more common symptoms of a protracted diarrhea are present, the result of local irritation. The disease occurs in children, the result of malformations of the anus or the rectum or partial stricture following some inflammatory process. Adults who have been confined in bed as the result of fractures, or any protracted illness as typhoid fever, suffer from fecal impaction. The condition is associated with the various forms of stricture, cancer, pressure from some other organ and to intestinal adhesions. People who live upon coarse cereals which form foreign bodies, and those having intestinal weaknesses due to spinal cord lesions, such as locomotor ataxia, often suffer from this affection, and it may result from the formation of enteroliths caused by lime salts in the drinking water.

Opium, lead, alum, tannic acid and lime salts are the drugs very prone to the production of fecal impaction, the result of lessened secretions and activity in the intestinal tract.

Symptoms. The disease will present the symptoms due to partial obstruction of the bowel dependent upon the size of the accumulation and its situation. From our knowledge of the nerve supply of the lower rectum, the symptoms of the presence of a foreign body soon follow its arrest at that point, but when the impaction occurs in the colon or sigmoid a long time may elapse before the irritation will cause symptoms

referable to that portion of the bowel. If the patient is thin, the mass may be felt through the abdominal wall, otherwise the diagnosis will have to be made from the history, tenderness over the region involved, symptoms of auto-intoxication, and the presence of a diarrhea which resists the ordinary treatment.

Treatment. The treatment of these cases should be directed to the thorough irrigations of the entire colon with plain water and the administration of a laxative for a few days. The alkaline salts administered during the day and the occasional use of cascara as a muscular stimulation is generally sufficient. The origin of the trouble may necessitate a continuous treatment to thoroughly empty the bowel. When it is possible, the administration of broths and plenty of drinking water should be encouraged and in some instances strychnine with cascara given for a protracted period. When the impaction occurs in the rectum its removal can be easily accomplished with the fingers or rectal scoop.

OBSTIPATION

Obstipation is the result of a mechanical obstruction to the natural passage of the intestinal contents and is a relative term used to describe a partial intestinal obstruction. The condition arises as the result of some deformity, impaction, growth, or stricture in the intestine that simply causes a mechanical obstruction from pressure or otherwise. In most instances fecal impaction results in obstipation, the causes being the same and it is impossible to clearly separate one from the other.

When fecal impaction and obstipation are due to hypertrophy of Houston's valves which occlude the lumen of the rectum and so obstruct the intestinal canal as to present symptoms of these conditions, valvotomy or partial removal of one or more of the valves is necessary. The Pennington, Gant's or some one of the variety of clips made for this purpose is applied to the selected valve and allowed to cut through by pressure necrosis. The sides of the valve after

its severance retracts so greatly as to permit the emptying of the bowel contents. A specially devised handle is made for these clips and the results are generally very satisfactory.

CHAPTER XVIII

PRURITIS ANI

PRURITIS ANI is the term commonly used to indicate an itching or irritation in the anal canal or on the peri-anal skin. This symptom or irritation is classified as a definite pathological condition occurring in this region.

Pruritis ani is practically the chronic form of a dermatitis, only differing from the acute in the change of color in the skin which becomes blanched or of a pure white appearance. The skin also becomes hypertrophied and brittle as a result of the deficient vascular supply and from the long continued inflammation or irritation. This changes the skin so that it may be easily torn or cracked by the finger nails of the sufferer in an attempt to relieve the itching. In the acute stage the skin of the peri-anal region is reddened, irritated and swollen. The inflammation may extend so far forward as the pubis or backward over the gluteal region.

Etiology. Eczema ani is one of the disorders giving rise to this symptom and is usually the first manifestation of the disease. In my experience pruritis ani is in the majority of cases secondary to some discharge from the colon or rectum or to a reflected constitutional disorder, as gout, rheumatism, tuberculosis, syphilis, diabetes, or it manifests itself in the form of a local skin disease. It may be due to a protracted catarrhal inflammation, to an ulceration of the rectum or fissure in ano in which there is a discharge of mucus or pus, which causes a constant moisture of the surrounding skin and excites a dermatitis in those predisposed.

Pruritis ani may be associated with a weak or disturbed digestive tract as the result of improper feeding manifesting itself in the form of a mucous colitis or a proctitis. The

mucus discharged in these diseases gives rise to the inflammation. A slight degree of moisture imperceptible to the sufferer in many instances is sufficient to initiate the itching or irritation of the parts.

Ring worm (trichophyton) is not an uncommon cause of pruritis ani and when suspected is best proven by the aid of the microscope.

Among children intestinal parasites are included in the list of frequent causes of pruritis analis, due to the pin worm, (oxyuris vermicularis), pediculi, lice and scabies. There are innumerable instances where the expulsion of intestinal worms, such as the round-worm (ascaris-lumbricoides) and the tape-worm (Teniæ), have been followed by the disappearance of symptoms which could be accounted for in no other way than by their presence. The marked tendency of the laity to dwell upon the importance of worms as causative factors of many childhood ailments has often led the physician to take the other extreme, in which he denies that symptoms of pruritis are due to their presence in the intestinal canal. It is certain that the highly sensitive nervous system of the child is susceptible to some other influences not as potent. The positive diagnosis must be made by seeing the parasite, in part, or its egg, when such symptoms exist which lead one to suspect that they inhabit the bowel. Parasites in the intestinal canal may excite a catarrhal inflammation, accompanied with the discharge of an irritating mucus.

Pruritis is also described under names intended to designate the region or location, as pruritis localis, pruritis puendi maris, and pruritis universalis; to the use of drugs as pruritis opii. Pruritis may accompany nephritis, as the result of uremic intoxication, diabetes or jaundice. These diseases represent more or less systemic disturbance resulting in irritation of the peripheral nerve ends, and can hardly be confused with a local condition in the intestinal canal. Commonly at the age of sixty, there is a more or less localized itching termed pruritis senalis which tends to become more distressing as age advances. There is no visible lesion or eruption, but the skin is slightly

thickened and rough sometimes. The skin may become pigmented from scratching. The disease is not ordinarily confined to the anal region. These causes suffice to point out that the itching may be only the local manifestation of a general disease reflexed in the anal region, and emphasize the importance of a thorough consideration of the patient's condition. Pruritis ani is often left uncured as a consequence of not recognizing the underlying cause.

Symptoms. Itching is the chief and almost the only symptom. In the acute form the itching is more continuous than in the protracted chronic form which designates and classifies the disease as pruritis ani. In the chronic form the itching is more or less intermittent in its duration which comes on after the bowels have moved or if the patient becomes warm in bed, which may be so distressing as to cause insomnia.

Treatment. The discovery and removal of the cause is of the first importance. When pruritis ani is associated with constipation, the condition should be relieved by the regular administration of a saline each morning or cascara given every night, and immediately after the bowels have moved to ensure the complete evacuation of the rectum, an injection of a few ounces of a twenty per cent. witch-hazel solution should be given, or a similar preparation. When the dermatitis is acute the parts should be bathed with warm wet cloths before retiring at night. After the surface has been dried any soothing ointment may be applied until the next cleansing. The following combination, according to different authorities, have proved satisfactory in the chronic forms to relieve the itching.

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℞   Pulv. Zinc Oxid .....................gr. xxx
    Lin. Camphor .......................ℨ s ℨ ss
    Vaseline ...........................ℨ i
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Before washing the parts the remains of the previously applied ointment should be removed with olive oil.

Ring worm can be relieved with a few applications of sulphurous acid or Wilkinson's ointment, which is as follows;

Sulphuris Sublimata ....

Picis Liquidae ....

Sapories Viridis ....āā ℥ vi

Terrae Albae ....℥ iii

Adipes Suis ....℥ i

Apply to excoriated parts.

Or ℞ Ac. Carbolic .... M. v

Ac. Salicyl ....M. xx

Ung. Zinc Oxid ....M. ℥ i

In the chronic form of pruritis ani the nitrate of silver solution in from four to ten per cent. applied every second day will suffice to relieve excoriations and bring about a healthy skin.   Along with these suggestions for external applications, the cause must be sought which is primarily of the most importance.   Gouty or rheumatic tendencies which excite this condition must be treated.

The most common factors as causes of pruritis ani will be found in the digestive tract in the form of chronic indigestion, associated with an atrophic or hypertrophic catarrhal colitis, sigmoiditis, or proctitis.   Topical applications are only temporary in their relief as a rule, when the underlying cause in the digestive tract remains uncured.   Irrigations of krameria as recommended for hypertrophic catarrhal colitis will be found most satisfactory in the treatment of these cases. Rhubarb and soda should be prescribed to regulate the bowels and improve the digestive tract, combined with tonics when indicated.

In view of the fact that many workers in rectal diseases attribute the causes of pruritis ani to disease of the nerves in the peri-anal skin, it seems that it is necessary to give the surgical treatment instituted by some of these authors.

Sir Charles Ball recommends dividing the sensory nerves supplying the affected area, under a general anesthetic in the following way: On either side of the anus an elliptical incision is made about one-half to three-fourths of an inch from

the margin, which is begun on either side of the perineal raphe and continued around the anus to the coccygeal raphe. The ends of these elliptical incisions should not meet anteriorly or posteriorly but should be separated at least three-fourths of an inch. The incisions are made deep enough to reach into the subcutaneous tissue. On both sides, the skin is separated by blunt pointed scissors from the underlying tissue for one inch on the peripheral side, and to the muco-cutaneous junction on the anal side, which should also extend beneath the underlying flaps of the perineum anteriorly and posteriorly. In this manner all the sensory nerves supplying the parts are divided. When this is completed the flaps are allowed to fall back in place and their edges stitched back with interrupted catgut sutures and a compress applied. The dressing should be renewed twice in twenty-four hours after the wound is sponged off with a weak solution of bichloride. The patient should be kept in bed and the bowels confined until the fifth or sixth day. Union of the parts should take place within this time and relief from the itching procured.

Martin modifies Ball's operation by interrupting each of the lateral incisions at the middle, in that manner leaving a connecting bridge of tissue between the internal and external flaps.

Krouse modifies Ball's operation by making six or eight linear incisions through the skin into the subcutaneous connective tissue, beginning at a point outside of the area of irritation, follow the course of the radii of a circle with its center in the anal canal.

Then the skin flaps lying between the adjacent radii are undercut until the whole affected area is undermined and separated from the overlying skin. In this maner he divides all of the nerve filaments. When the dissection is found difficult by this procedure every alternate flap may be loosened at the anal margin so as to permit more room and dissected outward toward the periphery. The parts are replaced and sutured as a final step in his technique. The objections cited against this operation are that while the purpose is the division of the

nerve filaments, the blood supply in many instances is also cut off, resulting in infection of the skin flaps.

The X-Ray and High Frequency Currents have not proved of success in the treatment of this disease and its use can hardly be advocated as a general treatment, but exceptional cases may be benefited.

CHAPTER XIX

HEMORRHOIDS

HEMORRHOIDS or piles are the terms used to mean a hypertrophy of the tissue and a varicosity of the blood vessels at the lower end of the rectum or at the margin of the anal canal. The disease has been recognized as a distinct entity and studied for centuries, in fact long before the Christian era and the history of medicine. There has been no definite theory accepted as to the cause of any but the thrombotic variety.

Classification. Hemorrhoids are classified in general, varying with the ideas of different authors as to their location, into the external, internal, mixed, (internal and external) thrombotic and nævoid (capillary). This classification is made broadly with the idea of simplifying the description, the causes, and treatment.

External hemorrhoids are located entirely outside of the anal canal, on the margin of the anus.

Internal hemorrhoids are situated entirely inside the anal canal and are covered by mucous membrane only.

Mixed or interno-external hemorrhoids are partially on the margin and partially in the anal canal, covered both by skin and mucous membrane.

Thrombotic hemorrhoids may be situated externally, internally or interno-externally and consist of a circumscribed blood extravasation, due to a thrombosis in one or more of the veins.

Nævoid hemorrhoids are the same as the nævous found elsewhere on the body and differ only in having a mucous membrane covering.

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Etiology. Hemorrhoids are found at all ages, although very seldom during infancy and childhood. At puberty there seems to be a pre-disposition to the formation of hemorrhoids. When occurring in childhood they are most probably caused by a catarrhal proctitis as the ordinary adult causes given for this disease seem entirely inappropriate, as age, menopause, dissipation, violent exercises, liver, kidney, heart or malignant diseases do not enter into the woes of childhood, and confine us to catarrhal and constitutional diseases almost exclusively. Constipation is a most common cause undoubtedly and when associated with severe straining might easily explain the presence of a thrombotic or an inflammatory pile. Diarrhea of a protracted nature may cause hemorrhoids because the irritation following the catarrhal inflammation may produce more or less permanent swelling in the form of a hemorrhoid.

Persons not properly clothed are liable to a sudden chilling of the body surface. This may bring about a congestion of the portal circulation and in that manner overload the hemorrhoidal veins which may in course of repeated congestions produce hemorrhoids. The disease is most frequent in middle life, next in advanced age, and least in children. Males seem to be more frequently affected than females. Occupations which require severe muscular strains, as heavy lifting, and constant standing or sitting in the erect position as followed by street car conductors, truckmen, laborers, deskworkers; also habits of over-indulgence in food and alcoholic beverages, carelessness in regulating the bowels, and the lack of physical exercise are common causes of this disease. Heredity, given by most authors, seems hardly a cause for hemorrhoids, but we must admit that as each successive generation is liable to the same inherited habits that might be conducive to hemorrhoids, the present generation might escape the affliction were these inherited tendencies omitted.

The disease is more frequent in very hot and very cold climates, due probably in hot countries to the relaxation produced by heat and sedentary habits; while in the colder coun-

tries there is a tendency to violent exercise in order to keep warm, and an over-indulgence in alcoholic drinks. In the spring, the portal circulation becomes congested because the system cannot consume the large quantity of carbohydrates

Fig. 59. Thrombotic hemorrhoids.

that have been used during the cold weather and when the extreme warm weather suddenly comes on, the diet is too rich in that class of foods, and the result is that the body cannot adjust itself. The erect position of man, and the

habit of being in the upright position for the larger part of the day, predisposes him to hemorrhoids more than any of the other animals.

Hemorrhoids are found as frequently in thin, anemic and temperate individuals as in the robust and plethoric, probably due to a muscular and nervous exhaustion resulting in a relaxation and dilatation of the venous system. Individuals suffering from disorders of the liver are commonly the subjects of hemorrhoids.

Constipation is probably the commonest cause given for hemorrhoids, as the solid fecal mass irritates the mucous membrane and the reverse pressure exerted upon the upright veins by the feces in the rectum results in their engorgement. This backward pressure strips the superficial veins in the opposite direction to which the venous current flows, producing mechanical strain and irritation of the mucous membrane and venous coats and is a starting point for this disease. The blood vessels of the rectum puncture the muscular wall in button-hole-like slits, about three inches above the anus. These divide into numerous branches distributed to the lower end of the organ. These slit-like holes are supposed to serve the purpose of valves in the veins.

Verneuil claims that they act as an obstruction to the venous flow and following a spasm or peristalsis in the rectal muscles, cause a constriction of the veins, congestion, and result in the formation of hemorrhoids. The arterial walls are so thick that compression is not so easy and the blood current is almost constant, while its return flow in the veins may be obstructed in this manner.

Tuttle claims that Verneuil's idea is more than a rational cause, for in order that these muscles act as valves, they would have to be in a state of tonic contraction, which we know is not the case, and that, if they were to act as valves, their efficiency would be doubtful, acting as the only valve between the liver and the rectum. The weight which a fourteen-inch column of blood, when in the upright position, exerts upon the thin-walled veins of the rectum, with the associated ca-

tarrhal diseases and constipation, are the most reasonable causes of the varicosed dilatations at the lower end of the rectum, which we call hemorrhoids.

Resinous cathartics are in general known to be the cause

Fig. 60. Internal hemorrhoids.

of hemorrhoids, as well as drugs which produce congestion of the pelvic veins, such as cantharides, myrrh, savine, apiol and ergot; also foods which irritate the mucous membrane and excite peristalsis, such as aromatic spices, mustard, pep-

pers, highly seasoned sauces, tamales, water cress or pickles, are frequently the direct causes of, or aggravate, hemorrhoids. Persons who suffer from idiosyncrasies which result·in digestive disturbances accompanied by acute catarrhal proctitis frequently suffer from hemorrhoids.

Strawberries and the carbohydrates eaten to excess are common causes. Diseases of the uterus, in the form of retroversion or procidentia, and genito-urinary diseases are often associated with attacks of hemorrhoids, due to a local congestion of the parts. Persons having heart, liver, kidney or nervous diseases, in which there is a relaxation or atony of the muscular structure, are frequent sufferers from internal hemorrhoids.

Cases of acute catarrhal proctitis have demonstrated the following theory to me as a probable cause of hemorrhoids in many instances and while the theory cannot well be demonstrated by proofs, I have presumed in many instances to follow its dictates in the treatment of these cases where no other causative factor could be thought of as a suitable substitute. When acute catarrhal proctitis persists in the form of a low grade or subacute inflammation, the hemorrhoids exist until the inflammation entirely disappears. Hemorrhoids due to this cause are most satisfactorily treated.

Should this most common course of the disease take place, and sufficient irritability persists to inflame the membrane, a gradual hypertrophy is caused, followed by a separation and sliding down of a small portion inside of the loose cuff of mucous membrane, at some point within the grasp of the sphincter muscles. The mere weight of the redundant membrane is sufficient to initiate the loosening and the subsequent formation of a hemorrhoid. This small hemorrhoid is quickly filled by the serous exudate from the vessels lying within its submucous tissue. The upright superficial vessels of the lower rectum acted upon by the descending fecal mass in a reverse direction to the normal current tend to swell up. These vessels temporarily distorted from their engorged condition, tear more of the mucosa and submucosa from the sur-

rounding tissue, and they are lifted gradually by the accumulating serum away from the muscular layer.

This condition existing for months or years occasionally becomes edematous from irritation or traumatism in the form of hard fecal movements. The parts are constantly in a state of hyperemia. This increased blood supply causes hypertrophy of the blood vessels and connective tissue, finally a well-organized hypertrophic mass becomes a recognized hemorrhoid.

Hemorrhoids existing in the presence of an atrophic catarrhal proctitis are, in my judgment, secondary to this hypertrophic inflammation and their presence is due simply to the serum forced within the meshes of the connective tissue of the submucosa, which, with the blood vessels, remains hypertrophied — the atrophy only affecting the mucous membrane.

The primary etiological factor in the causation of hemorrhoids from this point of view, is most probably a digestive disturbance, either in the stomach or intestine, with the fermentative excreta acting as an irritant, bringing about the inflammation of the mucous membrane. Indigestion in one or another form seems always associated with hemorrhoids.

We may find other well-known and positive causes of hemorrhoids, such as glandular disturbances — meaning the liver, kidneys or pancreas, or heart lesions, traumatisms, pressure due to pregnancy and to tumors, malignant disease of the rectum or adjacent organs, and to specific forms of catarrhal proctitis, as tuberculosis, syphilis, etc. These causes are not common. The large number of cases presented for treatment positively refute the assertion that everyone suffering from hemorrhoids also suffers from one of these serious diseases.

As a foreword to the treatment of hemorrhoids, the etiological factor or cause should be sought in every instance and then the proper treatment instituted. This word of advice may seem harsh when emphasized, but when we consider the subject as we do diseases in general, how can we expect to accomplish a cure of this malady until the true cause has been

established. Hemorrhoids are very often the only manifestation of an organic disease such as nephritis, hepatic or cardiac disease, which may contraindicate operation. One would certainly not advise operation upon hemorrhoids which are the result of hypertrophic cirrhosis of the liver, cancer of the rectum, intussusception, stricture or locomotor ataxia, examples of which one may see in the ordinary practice of medicine commonly complicating either of these affections. A cure under such conditions could only be accomplished by relief from the primary organic disease.

Most prevalent, as stated before, are the mistakes, so often serious to the patient, of a casual view of the hemorrhoidal region, the acceptance of the patient's description and then the prescription by the doctor of some ointment. Nature is expected to do the rest. It is natural to be careless occasionally, probably more so in the disagreeable tasks that appear as simple pathological conditions apparently satisfactory without further investigation in many instances. Often men of unquestionable surgical ability make this mistake, and a hemorrhoid operation is performed when an enucleation of the rectum for cancer would have been the proper scientific treatment. However, we all learn from experience and it is the man who refuses to profit by his mistakes that is open to criticism.

One should examine the rectum, sigmoid, heart, liver and the urine in every case, no matter how simple the hemorrhoidal condition appears; then only can the true cause be ascertained.

After having established the proof that no other disease is responsible for the hemorrhoidal condition, the question of instituting the proper treatment then presents itself. Very often the regulation of the patient's bowels and diet, the avoidance of violent exercise, and a moderation in all the habits of living, will greatly improve the hemorrhoidal condition. This in addition to prescribing an ointment containing belladonna, tannic acid and stramonium; the injection of a cup of cold hydrant water into the rectum before a movement and advising

the sufferer to avoid straining at stool, will, in a number of cases during the early stages, be sufficient.

Treatment. *Thrombotic Hemorrhoids* should be simply cut into with a knife or scissors to permit the escape of the clotted blood. Care should be exercised to make the incision in the longitudinal axis of the anal canal, to avoid a transverse cicatrization. The after-treatment consists in having the patient bathe the wound frequently with warm water.

Mixed Hemorrhoids (Internal and External). In most instances the treatment of this variety of hemorrhoids may be the same as that employed for the internal, as the external hemorrhoid is eradicated by the relief afforded from the removal of the internal portion. The ligature or the clamp and cautery operations are best suited to these mixed hemorrhoids. In applying the clamp care should be exercised to clamp only mucous membrane at one time, then clamp the skin subsequently. This precaution avoids the danger from hemorrhage later as the result of uneven pressure with the clamp.

A radiating incision should be made in a line from the ligated or cauterized hemorrhoid to permit slight oozing, which relieves the edema and pain following the traumatism due to the operation.

External Hemorrhoids. External hemorrhoids are best treated, when not too large, by the correction or relief from the coexisting constipation or diarrhea. As a rule, they do not warrant surgical interference on account of not obstructing the anal canal, as the edema from any inflammation spreads into the surrounding skin and does not annoy the sufferer as much as from the internal variety.

The question of relieving the constipation or diarrhea brings us to the possibility of controlling an atrophic or hypertrophic catarrhal condition of the rectum or colon. Cascara is best for the constipation or sweet oil in tablespoon doses to adults; and opium with castor oil for the diarrhea. The catarrhal conditions are discussed under a separate chapter. The daily irrigation with a twenty per cent. solution of krameria or witch-hazel for two weeks will give great relief in this form

of hemorrhoids. As to the ultimate cure without surgical means the cause will have to be taken into consideration in treating these cases. The surgical procedure is described under the treatment of the internal hemorrhoid.

Internal Hemorrhoids. Internal hemorrhoids are more often treated along the line of non-operative measures because they are so common and the fear of operation or the hope of a cure from the many proprietary remedies in use generally. Internal hemorrhoids when strangulated produce considerable pain and suffering. In the beginning the attacks are mild in character and are relieved within a few days. The attacks through habits of living sometimes become less frequent and finally pass away. In others, no attempt is made to correct the cause, and the attacks become more frequent and more severe. The hemorrhoids protrude more in each subsequent attack until often surgery is the only method of relief.

In all cases of strangulated hemorrhoids rest in the recumbent position should be insisted upon and the diet should be of a non-stimulating character. Highly seasoned foods and stimulations should be restricted entirely. Small doses of some saline cathartic should be administered to regulate the bowels. Frequent cleansing of the rectum, particularly after each movement, with a few ounces of plain warm water will relieve the tenesmus. Pain may be relieved by applications of hot fomentations in the form of flaxseed tea or gauze saturated in a twenty per cent. boroglyceride solution.

The lead and opium wash is very effectual in the early treatment of these strangulated hemorrhoids. The wash may be applied ice cold on cotton or gauze. The following ointment will be found of value which may be varied by the addition of tannic acid to control bleeding as it seems necessary.

℞   Ung. Stramonii ....
    Ung. Belladonii ....āā ℥ ss
    M Apply to hemorrhoids.

After protrusion, the hemorrhoids should be pushed up above the sphincter muscles, and soothing astringent remedies applied to the parts by means of the pile pipe or the finger.

Surgical treatment of internal hemorrhoids should be advised after a trial of palliative measures for a month or two, dependent upon their inflammatory condition and the associated or causative disease. When a fissure or ulcer or polypus exists, which might have caused tenesmus or expulsion of the hemorrhoids, operative treatment should be instituted without hesitation for the relief of the fissure, polypus and the hemorrhoids at one time.

Palliative Treatment. Palliative treatment or any measure which might be used for the cure of internal hemorrhoids are, as a rule, to be condemned for the reason that the radical operation for their removal is attended with so little danger. In some patients this is out of the question, as the physical condition of the individual or an associated serious disease prohibits the administration of a general anesthetic. In others, the nervous temperament, business, social arrangements and those who lack the courage to undertake surgical treatment are also to be included in the class for palliative treatment.

These patients request relief from the pain, bleeding and protrusion of the mass, and palliative treatment will afford, to a certain extent, temporary relief from all these symptoms. Protrusion is best relieved by regulating the bowels, preventing injury to the parts from hardened stools.

The pain and bleeding may be controlled by rest in bed, cold applications and injection of krameria, hydrastis, tannic acid, or witch-hazel in solution or in the form of an ointment. The diet should be one that is not excessive, simple in character and exclude the use of intoxicating liquors. Tobacco should be restricted to the smallest quantity that can be used without hardship to the inveterate smoker. Coffee and tea should be taken in moderation. Exercise should be advised for those of sedentary habits, and in the overworked and weak rest proves of great benefit to them. Horseback riding is

one of the best forms of exercise for stout persons but in others is apt to induce a prolapse of the hemorrhoidal mass. Exhaustion from late hours and nervous strains should be avoided and a regular time for going to bed and arising should be instituted in some cases, while with others care should be taken that the individual does not indulge in too much sleep and rest in bed. Sleep should be limited to eight or nine hours, followed by a cold bath, particularly in the warm weather. The regulation of the bowels is by far of the greatest importance, along with the proper exercise and rest. The regulation of the bowels should be such that the fecal mass be kept soft and unirritating and abdominal straining at stools prevented. The continuous use of saline laxative medicines for more than a week is generally harmful. After that time, remedies should be used which are intestinal muscle stimulants, and care should be taken to avoid the irritation caused by liquid movements. Cascara is a most satisfactory drug for this purpose and when intelligently used is probably helpful to all such cases. Cold water enema are sometimes more satisfactory than drugs. The cold water causes an immediate evacuation and regulates the bowels to move at a definite time each day. The cold water treatment, if carried on for a period of two weeks, will often institute the regular movement of the bowels for quite a lengthy time afterwards and impresses upon the patient the great benefit derived from regular evacuations.

Bleeding, associated with pain and the protrusion, can, as a rule, be relieved by the application of the formula of the late Dr. Cathcart, which is as follows:

R   Ung. ac. tannici ....$\tilde{3}$ ss
    Ung. stramonni ....
    Ung. belladonnae ....$\bar{a}\bar{a}\,\tilde{3}$ i
Sig.   Apply after reduction to the hemorrhoidal mass.

The hard rubber pile pipe makes an excellent means by which the application of an ointment may be made up above the internal sphincter muscles. The use of suppositories is

another excellent manner of applying these pain relieving and astringent remedies to the hemorrhoidal area as when they melt the parts are well bathed with the contained drugs. For this purpose, the following formulas are recommended.

R Ext. hamamelis ....gr. iii
   Ol. theobrom ....q. s.

R Ext. suprarenalis ....℥ iss.
   Ol. theobrom ....℥ vi.
Sig. Use immediately after stool and upon going to bed.

When excoriations, ulceration or bleeding exist, iodoform in quantities of from five to ten grains sometimes gives relief. Ichthyol, combined with other drugs, is used in almost all of the rectal suppositories for this purpose. The following as given by Tuttle is of great value.

R Ichthyol & tannic acid ....āā gr. v.
   Ext. belladonnae ....
   Ext. stramonii ....āā gr. ½
   Ext. hamamelis ....gr. x.
M Ft. In suppository number one.

The use of opium or its derivatives to relieve the sphincter spasm is to be condemned, because of its constipating effects, and the danger of acquiring the drug habit. The passage of a full-sized bougie, which is allowed to remain within the grasp of the sphincter five to ten minutes, is of much benefit to these patients. Where the spasm of the sphincter is well-marked, it is a good plan to examine the patient for the possibility of a coexisting fissure.

The palliative treatment of hemorrhoids is that form of treatment used by the so-called pile doctors, and it is to their credit that they learn of the habits and thoroughly understand the condition of the patient before advising such treatment. They remove the cause by the use of drugs and regulate the bowels; they relieve pain and the reduction of the hemorrhoidal mass by astringents and analgesics. There is no

doubt that many thousands of people are greatly benefited or cured by such methods.

Operative Treatment. Operative treatment consists in either the gradual or forcible dilatation of the sphincters, cauterization, injection, ligation, clamp and cautery, crushing, and excision.

Dilatation for the cure of hemorrhoids, as advocated by some operators, is probably of value only in those cases of hemorrhoids associated with ulcer or fissure which has caused a spasm of the sphincter muscles. How over-straining the sphincter muscles to such an extent as to cause a relaxation can benefit the hemorrhoidal area is hard to understand, as the mucous membrane is held in position and prevented from prolapsing by the tonic contraction of the sphincter muscle to a certain extent. In operating on hemorrhoids, it is unnecessary, from my experience, to dilate the sphincter muscles in the majority of cases as the relaxation due to the general anesthetic is sufficient to relieve the normal muscle tone, permitting the operator to manipulate the hemorrhoidal area without difficulty.

Electrolysis for hemorrhoids is limited to small internal hemorrhoids as a rule, and in patients in whom the radical operation is contraindicated. The method I use is as follows: The hemorrhoid is brought into view and either well painted over with a solution of cocaine hydrochloride (4%) or injected with the same solution. After five or ten minutes, the needle is introduced and the current permitted to flow through the tumor for a period of from ten to fifteen minutes at each treatment. The treatments should be given not oftener than every five or six days, dependent upon the condition of the hemorrhoid after the former treatment. The electrical current may be that supplied with the Le-Clanche elements or if the street current be available, the Mackintosh cabinet. The positive current hardens the tumor, coagulates the blood and will, in some instances, shrink it to such an extent as to make it a painful mass. The negative pole softens and moistens the mass so that the operator may neu-

tralize the effect of one pole by using the other according to his judgment at the time of the treatment.

This treatment has been described by most men of experience as ineffectual and unreliable, but some have had success in a few selected cases. This method of treatment, however, does not receive unanimous endorsement.

Electrolysis might prove the ideal method of treating the nævoid or capillary hemorrhoid, when the hemorrhoid can be brought down far enough to make the applications within sight.

Capillary or Nævoid Hemorrhoids. *Nitric acid treatment by cauterization.* The treatment of hemorrhoids by the use of nitric acid has been described especially for its use in the capillary variety of hemorrhoids. It is used for this variety as the safest and most effectual treatment. In these cases, a conical speculum is introduced and the slide drawn out until the pile protrudes into the opening within, it is wiped dry with absorbent cotton and acid applied all over the surface by means of a wooden applicator. The speculum is held in place for four or five minutes until the acid thoroughly attacks the tumor within. The parts are washed off with a solution of bicarbonate of soda to remove the excess of acid.

The applications are necessarily repeated two or three times at intervals of five days or a week. There is no necessity for local anesthesia when using nitric acid as it produces no pain in the mucous membrane. Care should be taken to avoid touching the margin of the anus with the acid, and before making the application the surrounding tissue should be smeared with vaseline. A suppository containing one-half grain of opium should be introduced to overcome the tenesmus following this procedure. Other escharotics used for this purpose are nitrate of silver, caustic potash, acid nitrate of mercury, arsenical paste, pyrogallic acid, and butter of antimony, but none of these are as good as the fuming nitric acid.

Carbolic Acid Treatment. The injection method has resolved itself almost entirely to the use of carbolic acid, with

glycerine and some astringent drug. The active principle for the destruction of the hemorrhoid tissue is due to the carbolic acid contained in the mixture. The use of carbolic acid for the treatment of hemorrhoids is one that is almost entirely dependent upon the individual experience of different authorities.

Recommendations for its use are given with the greatest scepticism and warnings of dangerous and disagreeable complications. Before discussing the technique, the treatment should be clearly understood, as the method is generally condemned by the profession in England and America. The possibility of serious complications are so great that its use can hardly be recommended by a conscientious practitioner without due consideration. However, this condemnation should not altogether deter one from trying the method in selected cases and where the radical operation cannot be substituted for it.

The carbolic acid method should not be advised when the hemorrhoid is strangulated and cannot be pushed above the internal sphincter, or when highly inflamed, ulcerated, or when largely hypertrophied. It is only applicable to internal hemorrhoids when small and in a fairly healthy condition. The duration of the disease does not contraindicate the use of this method, when the tissue is fairly healthy.

The complications for which the operation is to be condemned and which sometimes follow, are: very great pain, and swelling, an extensive ulceration, abscesses followed by a fistula, inflammation of the veins (phlebitis), pyemia and death from embolism.

In a successful operation the patient should not be confined to bed or detained from business longer than a few days. No cutting and no general anesthetic need be employed.

The amount of fluid to be injected is dependent upon the size of the tumor, and no general rule can be given as to the quantity to be used as each tumor may require ten minims (but no more), and the quantity must be graduated down from ten to two drops. The average amount necessary will

be from four to six minims of the solution. A suppository of opium, belladonna and iodoform combination should be introduced the first two nights to prevent bowel evacuation and to relieve pain, and it is best that the bowels do not move for at least forty-eight hours; afterwards, they are moved each day by a gentle laxative or cold water enema. This is practically all the after-treatment recommended by the average surgeon using the injection method. The inflammatory condition subsides and the swelling and bleeding usually ceases after the first day.

Sometimes there will be a prolapse of the injected hemorrhoid within twelve to twenty-four hours after the operation, therefore the patient should be warned against straining and the erect position avoided until this possibility is past. Should a prolapse of the injected hemorrhoid occur, the tumor should be replaced at once by gentle pressure or a soft sponge. Should strangulation and sloughing occur, the prolapsed hemorrhoidal mass will usually protrude. Sloughing occurs as the result of carbolic injections, probably due to injecting the fluid too close to the surface of the tumor. Sepsis probably is the result of infection from some outside source, rather than from the fluid itself. The solution is not capable of producing pus as it is strongly antiseptic, but infection might be carried on the needle or syringe if they are not properly sterilized previously.

The morning before the operation a mild cathartic should be administered; a soapsuds enema should be given about one hour before the operation and the tumor washed off with a two thousand bichloride of mercury solution. The patient should be placed in the Sims's position and each tumor should be exposed separately. The parts should be thoroughly cleansed, and a fresh solution for each injection should be made. The syringe and needle should be thoroughly sterilized. The amount injected should be accurately gauged. Care should be exercised that no air is contained in the syringe prior to injection. The fluid should be injected slowly into the pile.

The amount to be injected will depend upon the size of the pile-and vary from five to ten drops in each pile. The needle should be left within the pile until the mass turns white and care should be taken that the surrounding tissue is not injured as the needle is withdrawn. Pressure with the finger should be made to prevent the escape of the fluid. The hemorrhoids should be pushed above the internal sphincter after injection and the patient kept in the recumbent position for an hour or two after each operation. Only one hemorrhoid, or at the most two, should be treated at one time. The second injection should not be made sooner than five days after the first.

The following formulæ are used by different authorities for this work, and are quoted as given by them.

Shuford   ℞   Sodii biboratis ....
                   Acidi salicylici ... .āā ℥ i
                   Glycerini .... ℥ i
                   Acidi carbolici .... ℥ iii
               Misce.

Yount   ℞   Acidi carbolici .... gr. xxiv
                   Aquae destillatae .... ℥ i
                   M. (five per cent.) ....

Overall   ℞   Acidi carbolici ....⎫
                   Fl. ext. ergotae ....⎬equal parts.
                   Olei olivae ....⎭
               Misce.

Powell   ℞   Acidi carbolici .... gr. xiii
                   Tr. thujae .... ℥ i
                   Aquae destillatae .... q. s. ad ℥ ss

               Misce.

Agnew recommends the following mixture:

℞   Plumbi acetatis ....
    Sodii biboratis ....āā℥ ii
    Glycerini ....℥ i

Mix as follows: Place the container in a warm bath for fifteen minutes to hasten the solution of the salts, and allow the mixture to stand for twenty-four hours. The glycerin and graduate should be warmed to facilitate accurate measurements; the other ingredients should then be added. A sufficient quantity of Calverts No. 1 crystallized carbolic acid should now be liquefied by heat, and one ounce (thirty cubic centimeters) of it mixed with two drachms (eight cubic centimeters) of distilled water. A sufficient quantity of lead glyceride and borax (see prescription above) previously prepared, is then added to make exactly two ounces (sixty cubic centimeters). As follows:

R   Acidi carbolici cryst. ....℥ i
    Aquae destillat ....℥ ii
  · Sodii biboratis et plumbi glyc. ....℥ vi
Misce.

Brinkerhoff's famous mixture is as follows:

R   Ac. carbolici ....℥ i
    Ol. olivae ....℥ v
    Zinci chlorid ....gr. viii

From two to eight mimims are injected according to the size of the pile.

The Drs. Martin of Philadelphia recommend the dilatation of the sphincter under nitrous oxide gas in order to avoid complications that follow the injection method. This dilatation is done four or five days before the injections begin. They recommend the use of a small conical speculum especially designed by themselves, which has the distal end cut off at an angle of forty-five degrees. This angular cut permits the hemorrhoid to protrude into the lumen of the speculum so that by rotating the speculum a hemorrhoid in any position can be made to protrude into the top of the instrument. They recommend that each hemorrhoid be injected separately at intervals of from five to seven days, after first washing the hemorrhoidal area with some mild antiseptic solution.

The injection should be made directly into the most prominent portion of the pile very slowly, watching the color of the mass. When the hemorrhoid becomes of a whitish color, the injection should cease. Just before the needle is withdrawn, a drop is injected to seal the exit. The speculum is withdrawn before removing the needle, so as to permit the rectal walls to collapse, which serves to prevent the hemorrhoid from protruding after it has been injected. A solution of equal parts of phenol bobocuf and distilled water is freshly prepared and filtered. Should the solution become opaque it is useless. From seven to fifteen minims of this solution are used in ordinary cases. After injection they recommend the use of a suppository containing one-half grain of cocaine. A suppository containing three minims of ichthyol should be used at bedtime and one after the movement of the bowels during the entire after-treatment.

A fenestrated conical speculum may be used to advantage in these cases. A semi-solid diet is to be given for a few days, and only weak instead of a strong solution of caustic should be used.

Ligation. The ligature has been used by English surgeons for the cure of hemorrhoids for many years, and at present it is regarded by them as the best operation for the cure of internal hemorrhoids. Allingham and many of the noted surgeons of England have done much to popularize the operation. It is applicable to the internal and external as well as the mixed varieties of hemorrhoids. In this country, Mathews has been probably the strongest advocate of the ligature method. The ligature operation, as advocated by the English, consists simply of throwing the ligature around the base of the hemorrhoid, tying and cutting off the hemorrhoid down to the ligature. Mathews advocates the ligature method, modifying it by transfixing the hemorrhoid and tying on both sides, then cutting the mass close down to the ligature. Ricketts of Cincinnati recommends the submucous ligature of the hemorrhoid. These three methods of operating by the use of ligature are of unquestionable value and in

the hands of a skillful operator can be safely used as a scientific procedure.

Preparation. In the preparation of the patient for operation by the ligature or clamp and cautery method, the general health should receive first consideration and suggest the operative procedure. The contraindications to the administration of ether or chloroform such as heart, lung and kidney diseases are to be considered and should indicate to the operator as to whether office treatment might better be instituted. The day before operation the patient should receive a dose of some reliable cathartic, such as either licorice powder or epsom salts. Three or four hours previous to the operation, one or two quarts of plain water, or a soapsuds enema, should be given. This should be followed about one hour before the operation by an enema of a pint of plain warm water. As an additional safeguard and cleansing enema four to six ounces of peroxide of hydrogen may be injected into the rectum after the bowels have moved.

The diet during the day previous should be of semi-solid consistency and if an early morning operation is to be made no food or drink should be advised within four hours of the time for operation.

Submucous Ligation. Merrill Rickett of Cincinnati claims for this operation that it is impossible to have secondary hemorrhage; that no tissue is sacrificed; that there are no large areas of protracted ulceration, very little pain, no stricture of the gut, no infection and very little time lost in confinement. He advocates the following method of procedure: The patient is prepared as described above and the sphincters dilated. A large semi-circle needle is threaded with moderate sized kangaroo tendon and passed submucously around the base of each hemorrhoid. At the upper border of the hemorrhoid the needle is reintroduced and makes its exit at the point of introduction. In this manner, a complete submucous ligation is done. The ligature is drawn taut, the two ends tied and left hanging.

The hemorrhoid becomes very much distended and it may

be necessary to puncture large ones to allow the blood to escape, in order to prevent sloughing. The tumor should be replaced above the sphincter and a firm compress applied so as to prevent it prolapsing. Ricketts claims that it is not necessary to ligate all of the hemorrhoids which may be present, as an atrophic change takes place, which will often obliterate some of them. Submucous ligation should not be done on hemorrhoids situated closer than one-half to one inch apart.
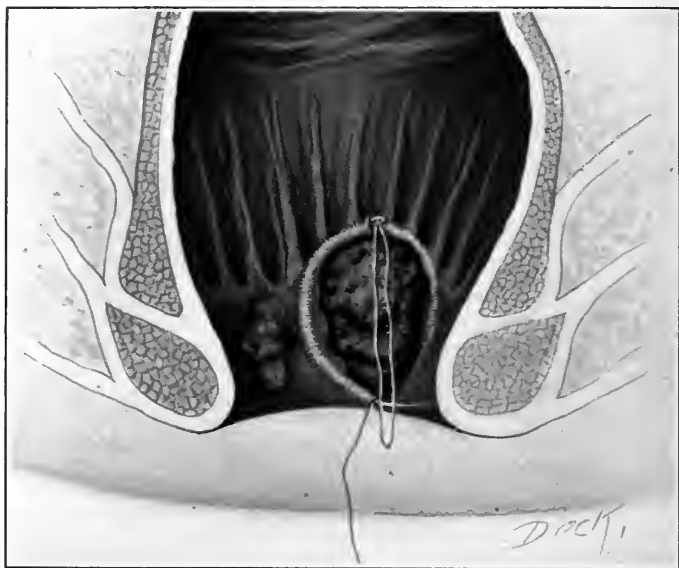
Fig. 61.   Submucous ligation of hemorrhoid (Rickett's method).

This method is open to the possibilities of infection, and subsequent abscess may follow buried ligatures in the rectal wall. Should the ligatures overlap or loop into one another it will result in a certain amount of contraction in the lumen of the gut.

Mathews' Method. The patient is placed in the Sims's position, the sphincter dilated and the hemorrhoids are brought into view with the aid of forceps or small retractors. The large tumors are caught with forceps, drawn out and held by

an assistant. A curved needle, threaded with strong, double silk ligature, is passed through the base. The needle is cut away and the ligature is tied first on one side, then on the other. After the tumor is tightly tied on each side, the pile

Fig. 62. Mathews' method of transfixation and ligation of hemorrhoid.

is cut off with a pair of scissors. The amount of the hemorrhoid to be cut away is a matter of individual judgment, but only so much of the mass should be left as will firmly hold the ligature. External hemorrhoids are incised around the base

and transfixed the same as with the internal hemorrhoid, the ligature being held in the groove made by an incision around the base of the mass. A suppository of morphine or opium should be administered and gauze compress and a T-bandage applied. Mathews claims that if a good sweeping cut is made around the skin tabs to be removed, the patient will be much more comfortable afterwards, and there will be very little danger of anal stricture.

The Ligature Operation is the oldest known scientific method of treating hemorrhoids and was practiced centuries ago by the ancients. Surgeons of the last century recommending its use are the eminent Sir Ashley Cooper, Van Buren, Bodenhamer, Syme and Allingham and, with the exception of the clamp and cautery, originated by Cusack of Dublin, is preëminently the ideal operation for simplicity and safety to the patient. The ligature operation can be very well adopted in the office treatment of cases when one or two hemorrhoids are the only cause of trouble to the individual, and it is well to bear this in mind and to be familiar with the technique. The ligature operation is easily performed under the use of local anesthetics. This method of treating office patients who refuse a more radical operation, and when only a single pile presents itself, has become my only method of treatment under local anesthesia. The technique is the same as under general anesthesia and the surgeon who has performed the operation under local anesthesia will find it quite easy under any form of anesthesia. The only difference is that under local anesthesia the sphincters cannot be dilated and the hemorrhoid must be pulled down by the finger or made to protrude by the injection into the rectum of an ounce of equal parts of glycerine and water, about an hour previous to the operation.

Ligature Operation under Local Anesthesia. The hemorrhoid should be forced to protrude sufficiently to allow the certain introduction of the hypodermic needle into the center of the mass. The anesthetizing solution should be slowly forced into it, so as to avoid a sudden, painful distention of

the tissue. After the needle has been inserted it may be turned in different directions without withdrawal and the barrel of the syringe may be refilled if necessary by simply unscrewing the needle while in position. If more than one puncture is made into the surface of the hemorrhoid the fluid sometimes runs out quite as fast as it is introduced. The distention should be sufficient to turn a portion of the hemorrhoid white, exhibiting at that point complete pressure anesthesia which will be followed later by the anesthesia of the particular drug used for the purpose. Often this single point of anesthesia indicated by the white spot will permit the grasping of the mass at once with an artery forceps and allow the inspection of the hemorrhoid for further manipulation. Within about five minutes the mucous membrane sulcus for the ligature may be cut around the base of the hemorrhoid and a strong linen ligature firmly tied within it. The portion of the hemorrhoid external to the ligature should then be cut away, care being taken to allow a sufficient stump to remain so that the ligature will not slip later. To doubly ensure against the slipping of the ligature some surgeons transfix the hemorrhoidal mass with a double ligature which is tied within the sulcus on both sides. After the hemorrhoid is cut, the escape of the anesthetizing fluid allows the mass to shrink, and unless the ligature has been drawn tight enough to allow for this shrinkage it will soon fall off and permit bleeding. The use of a heavy linen thread will prove most satisfactory as its strength will permit a good tight constriction of the mass without cutting through it.

Cocaine in various solutions is commonly used for this local anesthesia, but its strength should be of the minimum quantity so as to allow the free use of the fluid for the purpose of pressure anesthesia without the injurious effect of the drug on the patient, and also as cocaine is sometimes very unreliable in producing local anesthesia, even when a sufficient quantity has been introduced to excite the constitutional symptoms of an overdose.

Eucaine may be used in the same strength as cocaine, but

has the advantage of not being so poisonous. Ethyl chloride has been advocated by the inexperienced for rectal operations, but if one once tries to anesthetize the rectal mucosa with the solution, the experience will be sufficient to demonstrate the extreme sensitiveness of the membrane to the freezing process and another trial will not be ventured. Quinine and urea hydrochloride has become a favorite combination for rectal local anesthesia and is deserving of the most complimentary position in the category of drugs for that purpose. It has proved most satisfactory as to anesthesia and to its non-toxic effects. The only drawback to its superiority over cocaine and eucaine is that one must wait for five and sometimes ten minutes, before complete anesthesia is certain. When the complete anesthesia of the part has supervened, the area of sensitiveness is much greater and more widespread than with cocaine, in my experience. Cocaine anesthesia is not as lasting in its effects as quinine and urea hydrochloride, the latter being almost certain to cover seven or eight hours. This is a great advantage when we consider that it outlasts the nervous shock attendant upon these operations.

It is well to bear in mind that local anesthesia in the operative treatment of rectal diseases is dependent largely upon the dexterity of the surgeon in properly infiltrating the mass to be treated, so that the patient will not resist the necessary manipulation of the surrounding tissue. Often the pulling and handling of the adjacent parts during the local anesthetic operations will excite fear and a lack of confidence in the operator, which in turn may produce so much nervousness in the patient as to make them struggle when the ligature is tied. Undoubtedly tying the ligature is the test of local anesthesia. The cocaine solution should never contain more than one-quarter grain in its total volume and a solution of one to five hundred is to be recommended as sufficient and safe, in preference to the stronger solutions. This weak solution of cocaine will do quite as well, if properly introduced, and leave no doubt as to its possible poisonous effect.

As a preliminary step toward the attainment of success

with any of the infiltrating solutions used for producing local anesthesia, the correct diagnosis of the existing pathological condition under consideration should be of paramount im-
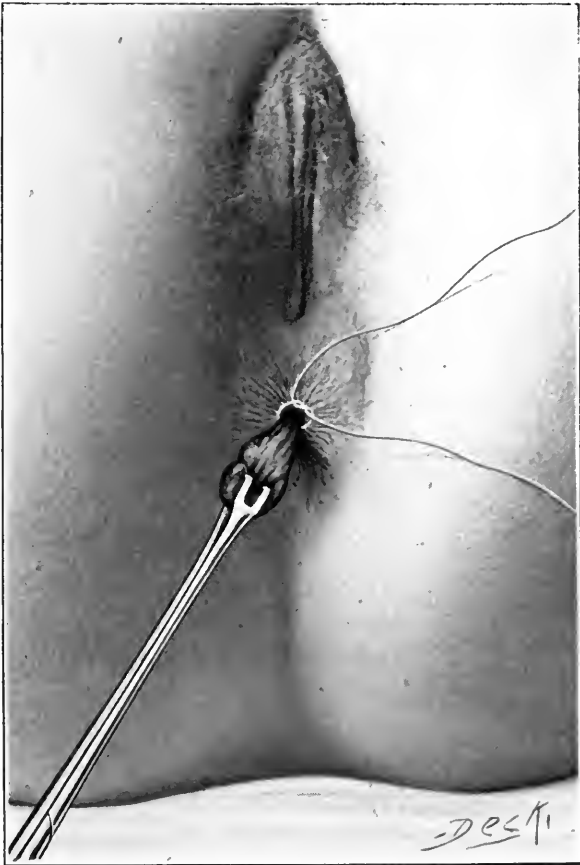
Fig. 63. Allingham's method of ligation within a sulcus cut about the base of the hemorrhoid.

portance. When one attempts to operate upon a fistulous tract which is tortuous and subdivided into several penetrating branches extending beyond the area which has been anesthetized, the incomplete freedom from sensation in the distant

tract results in pain and resistance on the part of the patient, which is often humiliating to the operator, to say the least. Under such circumstances it is far better to thoroughly understand the limits of work to be accomplished and to strictly confine our efforts within the region previously prepared for it.

When a certain diagnosis cannot be made before beginning operations on fistulæ, a general anesthetic should be recommended to permit thorough examination of the parts. In some instances, when the intention of the operator is to partially incise a long fistulous tract and he has purposely omitted complete anesthetization of it, exception to this advice may be judiciously taken. The following procedure is in favor among some practitioners. They anesthetize and incise a small portion of the tract on different days, until the entire course of the fistula is opened. This is both tedious and uncertain, but is acceptable to some persons who are timid and care little for the time it takes to relieve the condition.

In some cases hemorrhoids may exhibit all the symptoms commonly associated with the disease, such as protrusion at stool, bleeding, pain and tenesmus, but they may exist only as the result of one or two eroded hemorrhoids which act as an irritant to the sensitive anal canal, producing expulsion of the others. If forced to operate under local anesthesia to afford relief to these cases, one should select for removal the hemorrhoids which seem to produce the greatest amount of annoyance to the patient. The results, after the removal of these offending hemorrhoids, are very frequently most gratifying to the patient and surgeon and warrant the careful inspection of the affected hemorrhoidal area in an effort to select, if possible, a pile which is responsible for the trouble and remove it under local anesthesia.

Infiltration of the ano-rectal region is advocated by different operators in degrees varying with their personal experience and the amount of hemorrhoidal tissue to be removed. Where more than two hemorrhoids are to be the subject of this form of anesthesia, the entire anal ring and the rectal mucous membrane involved should be infiltrated. However,

care and judgment should be exercised as to the quantity of the infiltrating solution injected, particularly when the ligature operation is done without much bleeding or leakage. When sufficient fluid is injected to choke off the local blood supply from pressure, one may find later either a localized area of dead mucous membrane, or have the entire lower rectal mucous membrane slough. No attempt to produce pressure anesthesia over the entire anal region should be made by infiltration.

Sterile Water Anesthesia seems to act only by virtue of the pressure produced in firm, unyielding tissue, and is probably the initial anesthesia brought about with any hypodermic injection. Such anesthesia is very transitional and is confined only to the area which resists infiltration. Soft healthy or broken-down ulcerated tissues do not hold the water injection well enough to produce anesthesia, but hypertrophied, tough and unyielding hemorrhoids, which have existed for years, are often ideal for simple water anesthesia. In my experience not more than two hemorrhoids should be operated upon at one time under this form of anesthesia, for the traumatism to the surrounding tissue causes considerable pain.

A table to facilitate the computation of the solutions of cocaine, eucaine, quinine and urea hydrochloride has been appended and will be found very useful to the practitioner when called upon to perform local anesthetic operations in his office at a moment's notice. Very often patients become nervous when the preparation for the operation seems elaborate, so that any confusion or hesitation is best avoided. The instruments, solutions and the operating table should be prepared before the patient enters the room.

The Technique of the Operation as Performed Under General Anesthesia is as follows: The patient is given a dose of magnesium sulphate or a saline laxative the day before the operation, and placed upon a semi-solid diet. The morning of operation a high soapsuds or plain water enema should be administered about an hour before the operation, with a pint of simple water enema to clean out the rectum. Fol-

lowing this about four ounces of peroxide of hydrogen should be injected into the rectum for its antiseptic properties. On the day of operation the patient should not be allowed any form of nourishment.

The best method is to place the patient in the lithotomy position with the limbs well flexed and held with leg holders. The sphincter is then stretched and the hemorrhoids allowed to protrude. Each tumor is seized with the forceps, drawn down and the skin and mucous membrane divided at the mucocutaneous junction. The incision is carried around the base on its submucous attachment and a strong silk ligature is thrown around its pedicle and tied tightly, as close to the rectal wall as possible. The portion of the pile external to the ligature is cut off, allowing sufficient stump to ensure the holding of the ligature. Each tumor is treated in like manner. A firm compress is placed over the parts, secured by a well-adjusted T-bandage and the patient placed in bed.

Very large hemorrhoids should be transfixed through the center, near the base, as suggested by Mathews' method, to make certain that the ligature does not slip after the tumor shrinks. In performing the ligature operation, it is of the most importance to tie the ligatures so securely that they do not slip and permit hemorrhage, and this is best secured by transfixation. The bleeding from the muco-cutaneous incision is easily arrested by compression.

Ordinarily the ligature cuts through in from five to seven days, the exception is when the pile is hypertrophied and large. This complication occurs quite often with the ligature operation and is one of its drawbacks, as in some instances the ligature will not cut through within three weeks. When the ligature fails to cut its way through the entire stump, the remaining pedicle should be cut off with a scissors. Patients suffer considerably from pain during the first twenty-four hours, or the pain may last from three to four days. There may be heat and fullness in the anal canal and the patient is disturbed during the night by sudden twitching of the sphincter and spasmodic contractions of the levator

ani, induced by the ligated stumps acting as foreign bodies.

The operation is open to the possibility of infection, although not seemingly any more so than the clamp and cautery procedure, when the clamped hemorrhoid separates, as so often occurs after the introduction of a suppository, the examining finger, or the rubber tube.

The ligature operation certainly possesses equal merits with the clamp and cautery operation, and by many is considered better. This distinction should be made after an experience with both operations. The clamp and cautery operation can be performed as rapidly, is as free from hemorrhage or infection, and gives as good results as to permanent cure.

The After-treatment of these cases is of importance, but for some unknown reason is entirely neglected, excepting when complications demand urgent treatment. It has been my practice to remove the tube on the second or third day, after the administration of a mild saline laxative; to wash off the wound with a mild antiseptic solution, or peroxide of hydrogen, and insert into the anal canal, with the aid of a probe, a small piece of gauze saturated with a twenty per cent. solution of ichthyol in glycerine. The ichthyol acts as a stimulant to the repair of the mucous membrane and also probably has the virtue of a mild antiseptic. The bowels are moved every second day by a saline laxative, or the administration of cascara, and the patient is kept in bed for ten days to two weeks. The diet is increased on the second or third day after the bowels have moved. Should there be a retention of urine following the operation, as is very often the case, the application of hot wet cloths to the anus will avoid the necessity of catheterization. The patient should be instructed to keep the field of operation clean by the free use of warm water applied on a compress, particularly after the bowels have moved.

Whitehead Operation. The Whitehead operation or circular excision operation was first described by Mr. Walter Whitehead of England and consists of amputating the pile-

bearing circumference of the lower rectum. The operation has never become popular in either England or America excepting in exceptional cases where the ligature or clamp and cautery operation could not be substituted. The complications and sequelæ are so numerous and the operation so difficult, even under most favorable circumstances, that it is justly disapproved by most surgeons. This operation resembles the so-called *American Operation,* which differs only in beginning the excision above, instead of below the pile-bearing area. The technique of both operations are of value as an additional knowledge when operating for some of the graver rectal diseases and for this reason is part of the knowledge necessary in the surgical treatment of rectal diseases.

Complications which follow the Whitehead Operation. The complications and objections as enumerated by various operators are that it takes considerable time and dexterity; there is a copious bleeding; uncertainty of primary union; danger of stricture; and there is a possibility of incontinence owing to the removal of the sensory nerves of the pecten. These complications sometimes result from the operation with the ligature or clamp and cautery, but are most often associated with the Whitehead operation.

The Technique of the Whitehead Operation is as follows, under a general anesthesia: The sphincters are thoroughly dilated so that the hemorrhoids and redundant mucous membrane project from the anal orifice. The mucous membrane is incised at its junction with the skin and around the entire circumference of the anal margin. Care is taken to follow the irregularities of the skin all around. The external sphincter and lower portions of the internal sphincter are then exposed by dissection with the blunt end of a scissors or the handle of a knife, then the mucous membrane, with the attached hemorrhoids, is pulled down and brought below the skin margin. The rectal mucous membrane above the hemorrhoids is then divided transversely and sewed to the free margin of the skin below. This excision of the pile-bearing mucous membrane should be done in successive stages, each

portion being sewed to the skin progressively and continued around the entire anal margin. The blood vessels should be tied or better twisted when divided. During the excision of the mucous membrane care should be exercised not to remove too much superfluous skin, or skin tabs, as these tabs when left *in situ,* contract and eventually cause no further inconvenience.

Earle's Modification of Whitehead's operations is the application of a specially constructed clamp forceps which is applied transversely to the axis of the rectum, which clamps while cutting and sewing the tissue. The operation may be performed under local anesthesia by introducing the hypodermic needle at the anterior and posterior median commissure and infiltrating under the mucous membrane, but the operation is best done under a general anesthesia. The clamp may be applied parallel with the long axis of the rectum instead of transversely, in the judgment of the operator and dependent upon the size of the anal orifice. The sphincters are well dilated so as to bring the hemorrhoids well into view and an incision is made through the mucous membrane at the center of the anal orifice, posteriorly, sufficiently deep to allow Earle's clamp forceps to be applied at right angles to the long axis of the rectum. The forceps should include the mucous membrane to be removed in that segment. Care should be taken to include in the forceps more of the mucous membrane than the skin. The tissue outside of the grasp of the forceps is now cut away and a continuous suture is begun at the lower end of the wound and passed around and around until the ends of the forceps is reached. The forceps are then withdrawn and the suture drawn taut. The skin and mucous membrane is brought into position with a few stitches, begun from within and passed outward. Each hemorrhoid and all the redundant tissue is dealt with in a similar manner. Hemorrhage is controlled by the running suture, and cut surfaces are protected from infection during the operation by being held with the forceps until they are drawn together permanently. Medium chromicized catgut is the best

suture for this purpose. Pain should be prevented first by hypodermics of morphine, afterwards by acetanilid and coedine sulphate. The wound should be dressed four or five times during the first day, after irrigating with a solution of carbolic acid, one part to forty of water. The bowels should be moved on the fourth day. The patient should be allowed to get out of bed from the seventh to tenth day.

Earle recommends the use of Hebb's curved scissors to excise the tumors, and as in the Whitehead operation, large plain catgut is the best suturing material. Earle's operation is desirable in cases presenting one or two pedunculated hemorrhoids and relaxed sphincters, as in selected cases, which can be operated upon in the office under the influence of cocaine. There is some trouble in drawing the sutures taut after introduction and Earle has added to his forceps a small hook, over which each loop of the suture is thrown until all are placed in position. Each suture can be accurately and surely tightened without dragging too much upon the wound. This operation is attractive from the surgical standpoint, but is not nearly as simple as the ligature, or clamp and cautery operation, and has the objection that there is sometimes a failure of primary union, a greater destruction of the sensation at the lower end of the rectum, and the production of a circular stricture at the point of operation. It is probably a safe operation in the hands of the expert, but is not to be recommended for the general practitioner excepting in selected cases.

After-treatment. The parts are washed off with a solution of bichloride of mercury (1-1000) and a compress of sterile gauze is applied with firm pressure from a T-bandage. Later dress and wash with the same solution of bichloride of mercury, which should be repeated several times daily. The external incision should not be drawn together by sutures, as the edges of the wound will coapt themselves by subsequent granulations.

Tuttle's Modification of the Whitehead Operation consists of a plan for the easy detachment of the mucous membrane

and uniting such by section, after removing the hemorrhoidal
mass, which is of considerable help in the matter of saving
time and loss of blood while operating. The technique as
described by Tuttle is as follows:

" The sphincters having been thoroughly stretched, an in-
cision is made in the mucous membrane at the posterior com-

Fig. 64. Tuttle's modification of Whitehead's operation. Detaching the mucous
membrane.

missure and with the blunt point of the scissors, curved on the
flat, a dull dissection is carried with a boring motion upward
to the superior margin of the internal sphincter, the sphincter
is incised between the mucous membrane and this muscle and
gradually worked to one side and downward until it comes
to the muco-cutaneous border of the anus. Little by little the

hemorrhoidal mass is thus loosened from its muscular attachment and peeled out of its resting place, just as an orange is peeled from its skin. Having accomplished this upon one side, the instrument is turned to the opposite side and the same process carried out. The only point in this procedure at which any difficulty will be met is at the anterior commissure of the rectum.

" Having loosened the whole hemorrhoidal bearing area from its attachment to the muscular wall, the mucous membrane is cut just above the muco-cutaneous margin, and the hemorrhoidal area will thus be left loose in the rectum. An incision is then made in the mucous membrane at the posterior commissure, extending as high up as the hemorrhoids extend. Each flap thus formed is caught by clamps and the tube of mucous membrane with the hemorrhoids attached is dragged down. It is loosened above by pressure with gauze or dull-pointed scissors until the healthy portion can be brought down to the margin of the anus without tension. It is then cut off transversely above the hemorrhoidal mass, step by step, and sutured to the edge of the muco-cutaneous wound below."

Tuttle recommends large sized cutgut because it is less likely to tear through the mucous membrane than fine silk or other small suturing material. Chromicized gut and silk are condemned for the reason that they remain in the wound too long, which not only irritates but is apt to be followed by small abscesses. This operation as performed by Tuttle is probably the best manner in which to perform the Whitehead operation, as it has the merit of controlling hemorrhage and it is easier to attach the mucous membrane after the removal of the hemorrhoids. The suggestion for the detachment of the mucous membrane at the commissure is certainly a great help, as the close attachment of the mucous membrane to the muscular wall, particularly at the anterior commissure, makes its detachment much easier and less liable to faulty separation.

This operation is performed in from ten to fifteen minutes, a feature which makes it the most satisfactory method of per-

forming the Whitehead operation. When the skin tags are present, they may be cut off with the scissors and the edges sutured together or crushed with the clamp and collodion ap-

Fig. 65. Tuttle's modification of Whitehead's operation. Sewing muco-cutaneous sections together, as the pile-bearing area is progressively cut away.

plied. Tuttle claims that in none of his cases has there been any incontinence or loss of sensibility in the rectum.

The Clamp and Cautery Operation originated by Cusack

was done by clamping and cauterizing the stump with nitric acid. Mr. Henry Lee of London adopted the method of using the actual cautery, which is our modern method of performing a rapid operation; the quick cauterization of tissue by the actual cautery; the destruction of septic germs and the sealing up of the capillaries and lymphatics to prevent septic absorption. He also aims to protect against hemorrhage by crushing and cauterizing the hemorrhoidal mass. The advantages of the operation are that it is applied at one sitting and there are no ligatures to cut through by slow and tedious process. It is easily performed, its results are excellent. Finally, it is as free from complications as any other known hemorrhoidal operation. Altogether, from its merits, it has the recommendation of all American surgeons for application to any and all kinds of hemorrhoids.

The operation is practically free from pain after the first few days and from protracted ulceration or the danger of secondary hemorrhage. Dysuria or retention seldom lasts more than that period. Confinement in bed is generally limited to ten days or at the most two weeks and the operation may be said to be one of the simplest and surest of surgical procedures in general.

The technique of the clamp and cautery operation, under a general anesthesia, is as follows: The patient is previously prepared, anesthetized and placed in the lithotomy position, with the limbs held by leg holders. The sphincters are dilated by making pressure with the thumbs or the Kelly dilator, in the judgment of the operator. Dilatation of the sphincters under a general anesthetic is often followed by a certain degree of prolapse of the rectal wall, greatly in excess of the original hemorrhoidal mass, which is often removed and results in stricture at the anal orifice. Dilatation in most instances is unnecessary to but a slight degree. My rule has been to grasp each hemorrhoid before dilatation with an ordinary artery clamp so as to have them definitely located, then dilate with the fingers between the artery clamps. There are variously described clamps for this purpose called hemorrhoid

clamps, but experience with several of them has demonstrated that the ordinary artery clamp is satisfactory.

The originators of the operation recommend that after
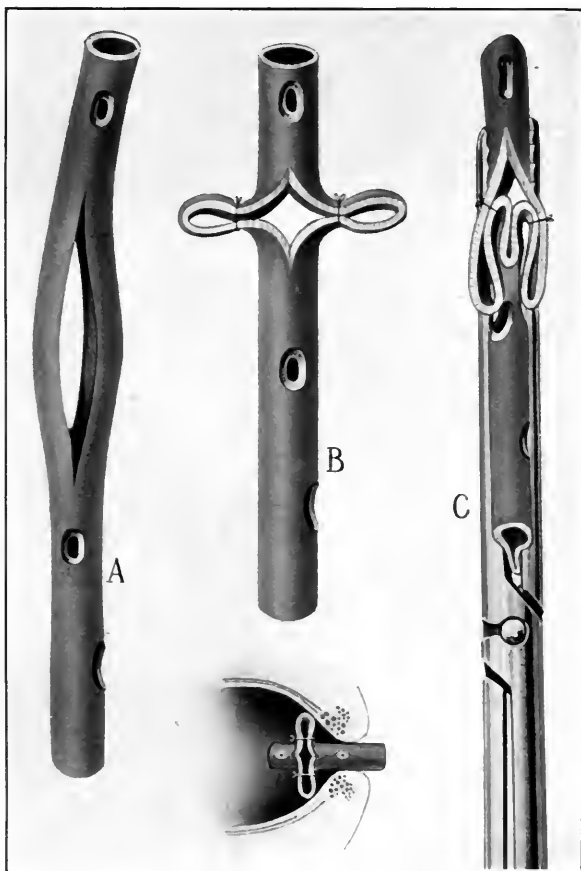
Fig. 66. Author's modified Pennington tube. Showing position in rectum and compressed tube which is easily introduced.

dragging the hemorrhoid down well into view and just before applying the clamp, a groove or sulcus be cut into the muco-cutaneous tissue to relieve pain from the subsequent edema. Cutting this groove results in a certain amount of bleeding

which is quite insignificant, but the operation can be as well performed by making a radiating incision from the end of the clamp line into the skin. This incision will allow the escape of serum and relieve the tension quite as well as cutting the groove. Both methods receive general approval and are very sure procedures to offset the pain following this operation.

The clamp is applied in the longitudinal axis of the rectum, grasping the hemorrhoid as near to its base as possible without tearing the mucous membrane, the blades are tightened and the hemorrhoids cut off close to the blades of the
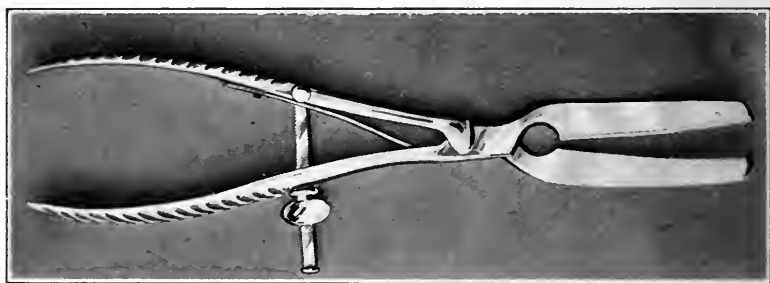
Fig. 67. Kelsey clamp.

clamp. The cautery is then applied and the hemorrhoid is cauterized sufficiently to leave a charred stump on the outer surface of the clamp. Care should be taken that the part of the tumor which is crushed by the clamp is not destroyed by the cautery. This destruction cannot be accomplished unless the point of the cautery is forced down between the blades of the clamp. When introducing the clamp avoid catching the opposite wall of the rectum by introducing the finger to offset such complications. Only mucous membrane should be clamped at one time; the same rule may be applied to the skin for external hemorrhoid. The hemorrhoids are situated in different quadrants of the rectum, viz: anterior, posterior and to the right or left, or in the median line anteriorly or posteriorly. Bearing this in mind when clamping a hemor-

rhoid, the relative position should guide one in the introduc-
tion of the instruments so as to avoid twisting or a transverse
cauterization of the tumor.   It one introduces the clamp over

Fig. 68. Application of clamp after hemorrhoid is drawn down.

the hemorrhoid, as indicated by the forceps previously ap-
plied in the long axis of the rectum, a stricture of the anal
orifice can hardly result.   .

After all the hemorrhoidal tumors are removed, a supposi-

tory of one-fourth grain of morphine, or one grain of opium with three grains of the extract of witch-hazel, should be introduced ; or orthoform may be insufflated on the raw surface to relieve pain. Most operators advise the use of a Pennington tube, which consists of a medium sized stiff rubber tube six inches long, covered with a fine rubber sheath or wrapped with iodoform or plain gauze. The tube is introduced about six inches into the rectum, and a safety pin put through the outer projected part through which adhesive plaster may be slipped to prevent, if possible, expulsion of the tube. This tube allows the escape of blood and prevents the distention with gas. Gauze is then packed around the lower end of the tube and a snug T-bandage is applied. The use of the tube is a question of judgment in the experience of many operators and possibly is unnecessary in the majority of cases.

The tube should be allowed to remain in the rectum for two or three days, according to the amount of disturbance its presence may cause, or removed at an earlier period if necessary. After the removal of the tube and the cleaning out of the rectum with the internal administration of magnesium sulphate or licorice powder which should be followed by a plain water enema, the wound should be thoroughly cleansed with peroxide of hydrogen and a small piece of gauze saturated with a twenty per cent. solution of ichthyol introduced. The ichthyol solution should be introduced every second day to stimulate healthy granulations. Patients that are dressed in this manner every second day are very materially benefited as compared to those that receive practically no aftertreatment to encourage granulations and offset sluggish ulceration. During the period of treatment the wound should be bathed each morning and night with water as hot as can be borne, which will aid greatly in the comfort of the patient and will stimulate healing.

The Clamps used for this operation are of the greatest variation. The original clamp used by Lee was a curved fenestrated forceps into which the tumor was clamped and crowded into a central pedicle or mass. Smith's clamp has

flat blades, on one side of which are ivory plates intended to
prevent the transmission of heat to the tissue beneath during
the cauterization. Gant's and Kelsey's clamps are modifica-
tions of the original Smith clamp. Kelsey's modification of
Smith's clamp is used largely. These forceps have the ad-
vantages of narrower blades, no ivory plates, and are provided
with a tongue and groove in the blades. The instruments
are powerful enough to completely crush the hemorrhoids
if necessary, and the edges are serrated to prevent slipping
of the tumor. They are made with metallic handles which
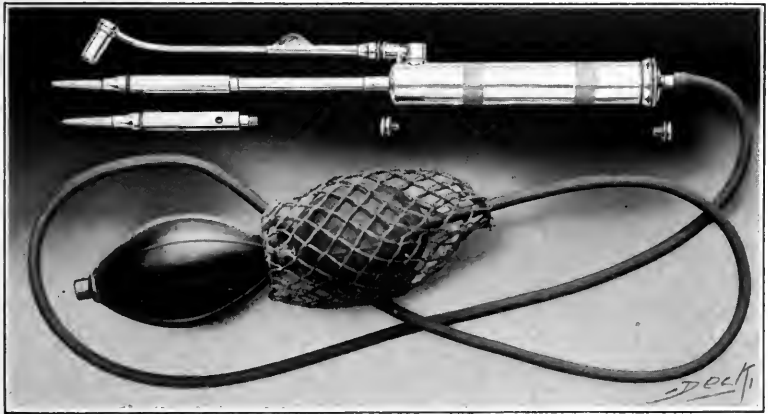
Fig. 69. Modified Paquelin cautery.

can be sterilized without injury. When applying the clamp,
in order to bring equal pressure on the hemorrhoidal mass,
the mucous membrane or the skin should be grasped sep-
arately. The practice of attempting to crush both skin and
mucous membrane with an equal degree of pressure at one
time is a common mistake, and is more often the cause of
hemorrhage than is realized. Hemorrhage after the clamp and
cautery operation is one of the commonest complications, and
if this could be borne in mind the operation would meet with
a more general approval.

The Modified Paquelin Cautery will be found the most use-

ful and reliable instrument for operating on hemorrhoids, and is also valuable for many other conditions in surgery. Before using this instrument the platinum tip should always be warmed to a white heat in the flame of an alcohol lamp or Bunsen burner and at the same time some benzine should be pumped into it. The instrument should be kept at a dull red heat while cauterizing the hemorrhoidal mass. A white heat is too destructive to the tissue and very likely to be followed by hemorrhage. The vapor should not be pumped through the instrument after it has cooled off. Too much benzine should not be placed in the tank, as it will be carried into the instrument and thus prevent its working. Before administering a general anesthetic, the instrument should always be examined and operated, to prevent the annoying predicament of clamping and cutting away the hemorrhoidal mass and then being unable to cauterize. Should the instrument fail to work, the base of the excised hemorrhoid will have to be sutured together.

The Ordinary Pyrography Cautery, supplied for burning artistic wood designs, has proven a most efficient and reliable instrument for the clamp and cautery hemorrhoid operation. The idea was suggested to me as a novel feature to the operative technique and I extended my experience with several such outfits, over a series of sixty clamp and cautery operations performed either in hospitals or in private dwellings. I not only found the cautery useful in hemorrhoid operations, but equally so in cauterizing the stump of an extirpated appendix. Its reliability was so certain that on several occasions I ventured to operate without the added assurance of carrying a Paquelin cautery with me. During warm weather I had no trouble in any way with the instrument, but in cold weather or when the operating room was chilly, the benzine became so cold that it would not volatilize quickly enough to supply the proper amount of ignition to the platinum tip and necessitated wrapping the glass bottle benzine-container with a warm wet cloth or warming it on a steam radiator for a few minutes. On one occasion the hole in the platinum

tip became filled with some sand or foreign substance which was easily washed out under water. The platinum tip is much smaller than the tip supplied with the ordinary surgical instrument and will not permit so long a contact with the mass to be burned, but with judgment it may be reapplied oftener to procure satisfactory cauterization. I can recommend it as a good substitute to those who do not care to purchase the more expensive Paquelin cautery, in the hope that the instruments necessary to the performance of the clamp and cautery operation may be cheaply supplied.

Galvano-puncture Treatment of Hemorrhoids. In discussion of the subject of local anesthesia, Kelsey of New York, in an article in *The Medical Record* of December 14, 1912, describing his personal experience in the use of local anesthesia in various affections of the anal ring, gives an especially interesting description of his galvano-puncture treatment of hemorrhoids. The treatise is as follows:

" Since substituting weak solutions of eucaine and cocaine, both used hypodermically or under the mucous membrane, I have had no occasion to change the form of anesthetic. Quinine and urea I had great hopes from until I was discouraged by Wyeth's bad results and abandoned it without any fair trial. It has always been rather a weakness of my own in surgical practice when I found a good thing to hold to it until I was sure of a better, which will explain why I have never yet performed a Whitehead operation for hemorrhoids and never expect to do so.

" Whatever surgery of the rectum is done under eucaine must be done without any very decided stretching of the sphincter. It is both useless and dangerous to try to overcome the sensitiveness of the whole anus by injecting an anesthetic subcutaneously to an extent which will permit of stretching the muscle. I tried it in the early days of cocaine and spent hours of anxiety over the untoward results though, fortunately, never having a fatal accident. This constitutes the first decided limitation to this method of treatment. Whatever is done must be either on the skin, as in fistula or

fissure, or through a speculum, as in hemorrhoids, or polypi, which cannot be extruded by straining. Were it not for this all of the minor surgery of the rectum could be done as well by local as by general anesthesia.

" It is this inability to properly dilate the sphincter which makes the treatment with local anesthesia inapplicable to any but the simplest forms of fistula, for the ordinary fistula cannot be operated upon with precision and success unless the sphincter be first paralyzed. Where the sinus is straight and without branches, where there is one opening on the skin and one on the mucous membrane and the surgeon can satisfy himself that this is the condition, local anesthesia and operations in one's office work most satisfactory. Where this is not the case and the sinus is tortuous and bifurcated the attempt to cure in this way will generally be a failure.

" And while upon this point it has often seemed to me that there is a way of curing fistula without any operation at all, which has never been tried out as it might be. I refer to the treatment of curetting, draining, and stimulating to healthy action which would be used on any old sinus not connected with the rectum. By it I have occasionally had successful results which have greatly surprised me and this not only in simple cases, but in cases so extensive that I have hesitated to inflict the injury necessary to secure a cure with the knife. Perhaps it is because a patient with fistula is usually willing to be operated upon and an operation is easier for the surgeon, while one with hemorrhoids is generally unwilling, that this method has not been more generally used. Or it is possible that the method is more common with the general practitioner than I am aware.

" Another condition to which attention may be called is slight laceration through the sphincter from parturition — cases in which it is only necessary to freshen the edges of the laceration and bring the ends of the muscles together by a few sutures. It is not long since I traveled a considerable distance to do just this little thing upon a lady of wealth and position whose life was that of a semi-invalid from incon-

tinence, after three or four failures to effect a cure with all the advantages of general anesthesia. Whether she would try once more or not depended entirely upon whether she must take ether or not, and hence I had small chance to choose. There was nothing remarkable in the fact that the operation was successful with eucaine, the wonder being that it had not been successful before, as the tear was only through the sphincters.

" From what I have said of the impossibility of stretching the sphincters under eucaine it follows necessarily that this method is not applicable to the cure of fissures of the anus by dilatation. But there is another way of curing a fissure to which it applies perfectly and that is by incision, and this treatment is just as successful as dilatation.

" Inject the eucaine not into the fissure, but underneath it from a puncture in the skin a short distance from the fissure. Then with a small speculum expose the part, at the same time making the muscle tense, and draw a sharp knife through it lengthwise once or even twice. Cut simply through the muscular fibers forming the base of the ulcer, not deeply into the cellular tissue. I have known it to fail to cure, but very seldom. I have also known thorough dilatation to fail just as often and for the same reason — the presence of prolapsing hemorrhoids which prevented cure by any method until they were removed.

" Coming now to the treatment of hemorrhoids by galvano- puncture under local anesthesia, provided it can be brought into reach without dilatation of the sphincter. The same statement does not apply to the removal with the clamp and cautery, for although the cautery may be painless the clamp will not be. This is due to the fact that the pressure of the clamp affects a much wider area than the hemorrhoid itself, and requires a much more extensive use of the anesthetic to prevent pain than does the application of the cautery. Hence this method of cure, which is my favorite one under general anesthesia, is never used under eucaine.

" But because the ligature may be used painlessly it does not

follow that when a patient presents himself with well-developed hemorrhoids requiring for their cure three or four ligatures, he should be placed on a table in the office and all his hemorrhoids removed at one sitting. This is not a proper office procedure. The surgical traumatism is too great, and the amount of eucaine necessary would be more than I should care to use at one time. Hence my own rule is to remove the tumors one by one at intervals sufficiently separated from each other to permit of the entire disappearance of all pain and soreness caused by each application. In this way many cases are cured and many more may be so greatly benefited as to consider themselves entirely cured, though not radically so; for it often happens that all the bleeding and all the protrusion are due to a single large tumor entirely covered by mucous membrane and easily extruded by the patient or brought outside by a speculum. It is in such cases also that the galvano-cautery treatment is most easily applicable.

" When the tumor has been brought outside the sphincter, puncture it at its most prominent part with a fine hypodermic needle and inject into its substance fifteen or twenty drops of a weak solution of eucaine. If the tumor becomes distended and grows whitish under the mucosa all is well and the application of the galvano-cautery will be painless. But it may happen that even with more fluid than this there will be no visible distention and the cautery will not be entirely painless, though the pain caused by it in such a tumor as I have described is seldom severe even when no eucaine at all is used. The failure to get local effect of the anesthetic I attribute to the fact that it is sometimes injected into a large vein and carried away into the circulation.

" After allowing time for the eucaine to take effect, take a small and delicate galvano-cautery wire, heated red, not white, plunge it into the tumor where the anesthetic has been deposited, and carry it well onward toward the center. The wire should be hot enough to burn its way easily, allowing for the cooling from contact, and it should be removed slowly, allowing it to burn itself loose. A white-hot needle plunged

into a vessel and quickly withdrawn will be followed by hemorrhage. A red hot needle left in for a moment and withdrawn gradually will cauterize sufficiently to close any vessel which it may have opened. Where the tumor is large a second puncture may be made before it is replaced.

" From such an application as this there is seldom any pain and the operation may be repeated on another tumor after an interval of two or three days. But after three or four such applications at short intervals the patient will begin to complain of some pain or soreness and this is a signal for stopping further treatment for a week or a fortnight till all symptoms disappear.

" And now what has been accomplished? A distinctly aseptic wound has been made in the substance of a vascular tumor, which will be followed by a slough, by cicatrization, and contraction, with decrease in size and vascularity, and the hemorrhoid will cease either to bleed or protrude. Moreover, the wound is from the surface inwards, there is a free exit for the products of inflammation, and the amount of tissue destroyed is absolutely under the surgeon's control.

" Compare this condition with that produced by the injection of an irritant or caustic into the middle of the same tumor and leaving it there to work what result it may and find its own way out, and it will be evident why I advocate and practice this method to the exclusion of that by injection.

" The one I claim to be safe, definite, and surgical. The other has often proved itself to be unsafe, a traumatism, the effect of which cannot be foreseen or always limited, therefore dangerous and unsurgical.

" The procedure thus far described, it will be noticed, is applicable only to hemorrhoids which can be brought outside the sphincter by an effort of the patient or the surgeon. Manifestly I have described the simplest first. The others, and they are the majority, require some little manipulative skill in the use of the speculum and some deftness of touch.

" When the tumor cannot be extruded it will be necessary to work through a speculum, and one of cylindrical shape as

large as can be used without too great stretching and with considerable bevel on the end will best answer the purpose. If the beveled end is introduced to the location of the tumor the latter will readily protrude into it and the subsequent steps are exactly the same as already described in cases where the hemorrhoids protrude from the anus. No forceps for holding the tumor are necessary. The speculum can be controlled with the left hand and the rest of the work done with the right.

" Do not be in haste to remove the speculum after the cautery has been used and before making sure there is not too free hemorrhage. Generally, almost always, the oozing from the puncture will cease as soon as the speculum is withdrawn and the parts return to their normal position, but sometimes there will be enough blood to worry the operator, and while the speculum is still *in situ* he may think it best to introduce the cautery needle again at the same spot and at a dull red heat to control this bleeding by a fresh cauterization. A better way, however, when the oozing causes anxiety is to introduce a tampon of gauze through the speculum and leave it in contact with the spot. A small tampon will give pressure enough; one which can remain till the patient goes next time to the closet, and very rarely will any at all be necessary.

" The variety of hemorrhoid which causes the most difficulty is that which is in great part composed of the vessels and tissues at the margin of the anus. I do not mean the grape-like external venous tumor, which should always be treated by incision, but the internal tumor of long standing and considerable size, which is only manifest when the patient strains and then shows itself as a swelling on one side of the anus covered by the skin, but which cannot be extruded sufficiently to show the upper part covered with mucous membrane or be distinctly defined. These are apt to cause more trouble by this or any other method of treatment, because any wound (incision, ligature, or puncture) which involves the margin of the anus will always cause more pain

and swelling than one confined to the mucosa of the rectum above the sphincter.

In such cases the tumor is best brought within reach with a bivalve speculum, one blade of which is largely fenestrated. This should be introduced with the fenestrum over the tumor, slightly opened, and then withdrawn until the hemorrhoid is pulled down by it into view. With the speculum holding the tumor thus within reach the eucaine and cautery are applied exactly as in the other case.

" And now as to results. For at least fifteen years I have practiced this method without an accident. There has never been an abscess or anything approaching it; never a moment of uneasiness on account of any bad result. A very few times, not more than half a dozen at the outside, have I had to reintroduce a speculum and put in a small tampon, as described, before I cared to allow the patient to leave the office, and this is the only difficulty I have ever encountered. The treatment, if not crowded too frequently, is almost painless, both at the time and subsequently, and it will certainly cure any case upon which it is used with sufficient thoroughness. But I do not consider the cure as radical as with either the ligature or the cautery. There is by this method a connective tissue tumor left in the rectum where there was before a vascular one. The blood vessels have been in part occluded and there is no more bleeding. The tumor has been so reduced in size that there is no longer any protrusion. The patients are, as far as they know, cured. But I usually warn them that after a few years (three, or four, or five) there may be some return which can easily again be cured by a few more of the same applications. Some of them return, many never do, because they remain without symptoms.

" Finally I should like to be understood as not claiming that this method has any advantages over the clamp and cautery except the single one of avoiding general anesthesia. All I have ever claimed for it is that it is a safe, painless, and efficient method of relieving and curing a great many patients who would otherwise condemn themselves to lifelong

suffering simply from an exaggerated fear of a surgical operation under ether.

" While upon this subject it has often been a surprise to me that more advantage is not taken of primary anesthesia. There is a moment in the preliminary stages of etherization when half the operations upon the rectum can be done without the patient's consciousness, provided the surgeon is a fairly rapid operator and the patient is placed in the proper position before the etherization is begun. This does not particularly appeal to the patient, however, because to him ether is ether, be it much or little, and an operation is an operation, whether it be done slowly or quickly; but it enables the surgeon to do a good deal of work in his office for which a hospital would otherwise be necessary."

The Crushing Operation. The crushing operation is probably one of the oldest for the treatment of hemorrhoids. It was formerly the custom to seize the whole tumor with the powerful flat-jawed forceps and then crush it, leaving the pulp thus formed to slough away. This method, however, is now obsolete. The operation was introduced by Pollock of London, in 1880, and later used by Allingham, who substituted a screw crusher, which he advocates for the internal pile only. The pile is drawn through the crusher, which is then divided and the projecting portion is removed with a scissors. The crusher is allowed to remain on the tumor for about one-half minute and then taken off. Allingham advocates the use of the crusher only when the hemorrhoids are small and few in number. The operation is only applicable to cases one would select as favorable for the injection method and for that reason is not likely to be popular in this country. The method is particularly free from hemorrhage, a shorter period is required for recovery and the pain is less than when the ligature is used.

Strangulated Hemorrhoids. Probably the most frequent demand for relief by operation is due to the strangulation of the hemorrhoidal mass. Strangulation occurs from either the prolapse of the hemorrhoidal tissue or to an inflammatory

condition, which causes an edema sufficient to extrude the hemorrhoids. Prolapse without irritation may result in strangulation after unusual straining, lifting, and inflammation. It may have its origin in a fissure, or be due to the bruise or abrasion of a hemorrhoid from a hard stool. Polypi or malignant tumors are frequently associated with strangulated hemorrhoids.

Dilatation of the sphincters with either the fingers or the common rectal dilator often gives relief in the simple form of strangulated hemorrhoids, as is proven by the sale of these dilators in the shops for the cure of hemorrhoids. Mild cases complicated by the presence of a fissure in ano, which is responsible for a certain amount of tenesmus, are also benefited by a mild degree of dilatation which may be classified as a palliative form of treatment. Strangulation occurs only with the internal and mixed varieties of hemorrhoids, as the external variety cannot be grasped within the sphincter.

When strangulation has gone so far as to become gangrenous the operation is considered by some as unnecessary and they permit the mass to slough off as would occur with prolapse of the rectum. This procedure is seemingly unnecessary as the tendency of the slough is to involve a large area of the mucous membrane and therefore is not definite in its outline. Subsequent healing must occur by slow granulation, the tissue is devitalized and much more subject to infection. The operation by the clamp and cautery can be performed in from fifteen to twenty minutes, the tissue is sealed by cauterization, the wound is definite in its area, and nature is assisted materially in its efforts at healing.

Hemorrhoids which have not become gangrenous, or when operation is postponed or inadvisable, are best treated by placing the patient in bed, with the hips elevated. Compresses soaked in hot water or a twenty-five per cent. boroglyceride solution should be applied to the parts and a hot water bag laid over these to maintain the heat, which will encourage the circulation and prevent suffering. Cold applications should not be used in these cases, as everything

should be used to encourage a healthy circulation. During the period of strangulation, there is apt to be a rise in temperature of one to two degrees, accompanied by pain and distress, due to the prolapse or strangulation, and the patient is usually eager for surgical help to get relief.

Accidents and Complications which follow operation are pain, strangury, dysuria, hemorrhage, tetanus and erysipelas, varying with different individuals, with the operation, the method of anesthesia, the degree of operative interference and the place of operation. Local anesthesia sounds well to the average patient and is often the only method available for a certain class of people that fear the knife, but taking the subject broadly, local anesthesia is as uncertain in its relief from pain in rectal work as in other portions of the body. While one can do preliminary work and sometimes a complete operation, with only a reasonable amount of suffering, unexpected complications met with often give rise to considerable pain. Local anesthesia, therefore, should only be used in cases where one or two hemorrhoids are to be removed and the operation made as short as possible, so there will be little chance for drug poisoning and suffering.

The ligature operation gives more pain for a longer period than the clamp and cautery and, if we leave aside the consideration of other complications, it is altogether not so favorable an operation as the clamp and cautery. Excision of the hemorrhoidal mass (Whitehead operation) causes very great pain for a period of from eight to ten hours. After this, however, it subsides and practically ceases.

Opium or morphine are by far the best remedies to control the pain after hemorrhoid operations, and may be combined sometimes with bromide of soda for nervous individuals. Hot water compresses relieve pain and congestion and are advisably combined with the opium treatment in these cases. Orthoform or pure iodoform or ten per cent. ointment of ichthyol applied before stools often relieves pain.

Strangury and Dysuria are most frequent complications with ligature operations, either under general or local anes-

thesia. In some instances it persists for from two days to a few weeks. Catheterization is sometimes necessary after the clamp and cautery and excision operations but not so frequently nor persistently as after the ligature. As a rule, the closer the rectum is packed the more likely we are to have this complication. The simplest relief from this difficulty is with the hot water compress applied directly to the field of operation. If properly and frequently applied this treatment seldom fails to relieve the sufferer. The knee-chest or the erect position seems to assist in emptying the bladder. If catheterization be necessary strict asepsis should be enforced to avoid infection of the bladder.

The period of confinement after hemorrhoid operations varies with the method of operation from a few days to several weeks. An ordinary local anesthesia operation should not confine the patient to bed for more than a few hours or a few days at the most. The period of confinement after the clamp and cautery operation is from three to ten days, according to the judgment of the operator. According to the advocates of the ligature operation, the patient should be confined in bed for one or two weeks and kept in his room for two or three weeks longer, if necessary, until the ligatures cut through. The time necessary for the ligature to cut through varies from five days to five weeks and it is generally impossible to tell with any degree of certainty how long the patient will be confined after operation by the ligature method. If the patient be permitted to walk about before the ligature cuts through, there is danger of hemorrhage.

Secondary hemorrhage occurs more frequently from the ligature operation, but can be expected with any method of operative procedure in this region. The hemorrhage occurring after any of these operations has been so greatly exaggerated in description that many experienced operators are really afraid of it. Where bleeding is expected from complications during the operation, the introduction of a suppository containing three to five grains of witch-hazel or one to two grains of tannic acid, will usually control slight

bleeding. When bleeding occurs after operation it may be controlled by packing the rectum. To do this effectively the rubber rectal tube, ordinarily inserted after a hemorrhoidal operation, is wound around with a piece of gauze at about the middle of the tube, acting as a guard to prevent slipping. The tube is then put through a small opening in a square piece of gauze about the size of a gentleman's handkerchief. The gauze should not be allowed to slip past the guard on the tube. The tube is then pushed into the rectum so that the guard is above the internal sphincter. A firm packing is then introduced into the sort of pouch which it forms. Care should be taken to avoid bursting the rectum. Alling-
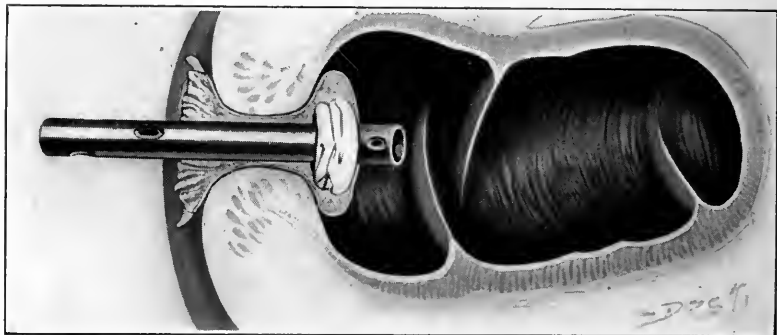
Fig. 70. Control of bleeding by packing rectum with gauze, using Pennington tube.

ham has originated a conical sponge for this purpose, which is introduced into the ampulla of the rectum through a tube and then drawn down upon it by a cord which runs through its center.

The use of chloride of iron and other astringents are as a rule injurious and very irritating to the parts. Hot or cold water is best tried first for a few minutes and if not a success the Pennington tube will certainly give happier results. Should this not control the hemorrhage the patient should be anesthetized, the sphincter dilated and the blood vessels caught and tied. In the excision method the bleeding during the preliminary excision is always considerable, but sec-

ondary hemorrhage is practically unknown unless from some meddlesome interference.

Erysipelas infection occurs very seldom, but in the history of nearly all our old hospitals, death has been reported a few times from this cause. This form of infection is less likely to follow the clamp and cautery operation because the red heat of the iron not only kills the germ, but seals up the wound from further infection. Créde's ointment is said to be almost a specific for erysipelatous infection following a hemorrhoidal operation.

Tetanus also follows hemorrhoidal operations and in a number of cases reported where death was due to this disease, statistics show that in every instance the operation performed was the ligature method. No cases have been reported where tetanus followed the clamp and cautery or excision methods. Death from tetanus is almost a certainty after infection in these cases.

Abscesses and Fistulæ sometimes follow either of the methods in vogue for the surgical relief of hemorrhoids and are the result of infection brought about as a rule by traumatism in handling the parts or stretching the sphincters.

Stricture of the anal opening is probably more common following operations with the intention of removing all redundant tissue at the time of operation. One should recognize the fact that strangulated, swollen hemorrhoids are in part edematous and that when the irritating cause is removed or relief is given from the spasmodic contraction of the sphincters, the size and volume of the hemorrhoidal mass will be greatly decreased. This is proven by the subsidence of the swelling between attacks of hemorrhoids as experienced by nearly all patients before they seek surgical aid. In the clamp and cautery operation stricture seldom results. Before removing these tumors it is well for the operator to form an idea as to the exact amount of redundant tissue which should be removed in order to bring about a normal condition, irrespective of the swollen and distorted appearance of the anal canal. This should be done while the patient is under the influence of a

general anesthetic which causes a general relaxation of the body tissue. If operating under a local anesthetic the swelling produced by the hypodermic injection of the fluid is very likely to confuse one.

In the ligature operation stricture results from tying off too much or too large areas of mucous membrane. After the Whitehead operation, the stricture is likely to occur even under the most favorable conditions, as excision of the mucous membrane in its entirety and its union to a circular line in the skin can only form a circular cicatrix. This results in more or less of a stricture, dependent upon the amount of fibrous tissue formed beneath. Stricture may occur when the mucous membrane pouts above the line of union, forming a sort of roll on the wall of the anal canal. Ulceration and fissures at different portions of the anal canal are of common occurrence as the result of either the clamp and cautery or ligature operations but are easily healed within three to four weeks if the wound is kept clean with hot water, or peroxide of hydrogen. In conjunction with these aseptics some stimulating application in the form of twenty per cent. ichthyol solution, or balsam of Peru, introduced on a small piece of gauze into the anal canal every second or third day, will be found very efficacious.

CHAPTER XX

NON-MALIGNANT GROWTHS OF THE
RECTUM

THE non-malignant tumors of the rectum are commonly classified as *polypi*. The term is applied to any outgrowth having a narrow, pedunculated attachment and a large pendulous extremity. Any benign tumor occurring in the rectum as a rule becomes pedunculated in time, due to the weight of the mass and the straining during defecation. The ano-rectal region is commonly the site of these benign growths. They are found in children at almost any age, but occur more frequently in adults. They may be single or multiple, large or small, rough or smooth, globular or elongated in shape. In consistency they vary with their structure, being soft or hard, friable or tough. While found most frequently in the rectum they may occur in any part of the intestine. As a rule they are the color of the normal mucous membrane but may be pale or of a purplish hue.

Sometimes inflammatory affections of the intestinal mucous membrane and submucosa are the seat of inflammatory growths involving both the connective tissue and epithelial layer. These growths are usually the result of necrotic or inflammatory processes which produce swellings or protuberances into the lumen of the gut, resembling non-malignant or malignant pathological conditions. Most non-malignant tumors found in the rectum and anal canal are in the form of polypi which involve the mucous membrane.

The term polypus as a rule is used to designate the pedunculated growth involving the mucous membrane of the rectum, irrespective of its histological character. The rectum may be the seat of almost any of the histological forms of

benign neoplasms which are found in the same character of tissue at other portions of the body. The following types are the most common: 1. Hypertrophied solitary follicles; 2. Adenoma, 3. Fibroma, 4. Lypoma, 5. Myxoma, 6. Myoma, 7. Enchondroma, 8. Lymphadenoma.

Hypertrophied Solitary Follicles are the most common form of polypi found in children. They are of a soft, mucous type consisting of alveolar tissue, the meshes of which are filled with a viscid fluid. The mucous glands of the intestinal wall are sometimes dragged into the tumor during its process of formation which may give it the appearance of a cyst. Sometimes the tumor will contain true Lieberkühn tubules.

Adenoma or glandular polypi, are composed of typical glandular epithelium which corresponds to the normal tissue in which they are found. By comparison they are found in the intestinal tract more commonly than any other form of benign outgrowths, and are encountered in the rectum far more frequently than in any other portion of the intestine. Simple adenomata are common in children but comparatively rare in adult life, excepting when they have followed some irritating discharge from the intestine above. Malignant adenomata are more common in persons past middle life and are seldom seen during childhood. The typical adenomas have a well-marked basement membrane between the cell layer and the stroma, but when the growth progresses rapidly and atypically this basement membrane may be absent. The gland cells are the dominant agents and while the stroma is essential to the growth, the cells precede the formation of the stroma. Adenomatous polypi may be single, multiple, and disseminated and may occur in any part of the rectum. However they are most often located at the junction of the movable and fixed portions of the rectum.

There seems to be some relation between the existence of rectal adenoids and similar growths located in the nasopharynx, as pointed out by Gant. This condition seems evidently the result of a lymphoid hypertrophy manifested in the constitutional condition.

Adenomata when completely removed do not recur as a rule, or infect neighboring lymphatics; or give rise to secondary deposits. When death results from adenoma it is as a result of mechanical obstruction, depending upon the situation and size of the tumor. Adenomata in the adult are generally considered as having a very strong tendency to become malignant, either in the simple or multiple varieties. The multiple variety seem to have the greatest tendency to this malignant transformation.

Fibromata of the rectum and anal region are composed of fibrous connective tissue formed from the submucosa and often grow to a considerable size. True fibroma is infrequently found in this region. The fibrous tissue is arranged in wavy bundles and ordinarily contains few blood vessels.

When located upon the skin about the anus they present a hard, glistening tumor, having a broad base. When in the rectum they present a pale, nodular and firm pedunculated tumor. Sometimes they are of the cavernous type. When the fibroma remains within the intestinal wall it is of spherical or ovoid shape, closely attached to the muscular coat and the mucous membrane is movable over it. The symptoms then are like those of mucous polypi.

Lipomata are tumors composed of adipose tissue principally. Their favorite site is in the upper rectum but they are occasionally found in the peri-rectal tissue and on the buttocks. When within the rectum they develop in the submucous layer and assume a polypoid shape, with a pedicle. They may grow so large as to drag the rectal wall and cause a prolapse. They are dark brown in color and are characterized by an unusually long pedicle. Sometimes these tumors drag the rectal wall to such an extent as to cause a peritoneal invagination into the pedicle, which is important from a surgical standpoint. When peritoneal involvement is suspected the tumor should be removed by an incision of the mucous membrane and the wound closed by sutures.

These tumors are composed largely of isolated cells of a stellate appearance, separated from each other by a matrix

containing mucin. The blood vessels within this matrix are large and thin-walled. A true lipoma is of rare occurrence, and as a rule the tumor presents more or less fibrous tissue or cartilaginous masses. In other specimens, portions may present a sarcomatous-cell type, resembling the spindle cells.

Myxomata are slow in growth and present the characteristics of a cyst or fluid mass on palpation. They do not form metastases but when imperfectly removed are likely to recur and a certain proportion undergo a sarcomatous degeneration. The most common site of these tumors is on the buttocks between the gluteal muscles. They are sometimes found in the form of multiple, soft polypi.

Myoma are tumors seldom found in the rectum. They are composed of muscular tissue intermingled with fibrous tissue generally, and are described as myxo-fibromata.

Enchondroma is composed of smooth, hard, firm cartilaginous tissue and is one of the rarest of rectal neoplasms.

Lymphadenoma. This variety of non-malignant growths is occasionally found in the rectum. It originates from the lymphoid tissue or the solitary nodes throughout the large intestine. It is formed of a reticulum of branching cells which are united by their long extremities and within the meshes thus formed are found round cells with circular nuclei. Lymphadenomata do not produce different symptoms than those of other polypi, excepting that they do not bleed nor discharge mucus or pus. When mucus is associated with their presence it is due to a catarrhal proctitis excited by the presence of the growth, or to an irritation of its external surface. They are always single, slightly lobulated, of soft consistence, and of a bright red color.

There are many rare histological types of non-malignant neoplasms which have been found in the rectum or anal region, but their occurrence is so infrequent that a description here is hardly of practical use.

General Diagnosis. Polypi of the rectum are common growths in both children and adults. They are probably more common in women and children than in men. These

growths are situated at any place, from the ano-rectal junction to the large intestines. They may occur singly or in large multiple growths which bear the characteristics of their pathological nature, being smooth, irregular or globular in shape. Their consistency may vary from a softness to a hard, friable or a tough tumor which may be very small or large in size. Rectal polypi, as a rule, are pedunculated, rounded tumors which are myxo-fibromatous or adenomatous in character. The most common in children is that which probably originates in an inflamed solitary follicle. Polypi of the rectum may also include lypoma, myoma, angioma, teratoma and other pathological forms. The disease is commonly confused with hemorrhoids, prolapse or malignant growths, while the symptoms, due to the irritation and destruction of tissue, are often mistaken for a protracted diarrhea, ulceration, bleeding from hemorrhoids, or catarrhal colitis. The diagnosis should be made with the aid of the sigmoidoscope or the proctoscope and a piece of the tissue submitted to microscopic examination when the growth is extensive. When a polypus exists singly, with its pedunculated base to verify its chief characteristic, a diagnosis of its exact pathological condition can be more easily made after its removal. One of the chief diagnostic points in differentiating a polypus from a malignant growth is this distinct tendency to the formation of a pedicle, while in cancer or sarcoma there is not this characteristic, unless the malignancy is secondary to adenoma which have this tendency to malignant transformation.

The Symptoms are those due to irritation and tenesmus, the result of the presence of the foreign body in the rectum. There may be the discharge of blood, mucus and broken down tissue, but ordinarily, when the polypi are single, the patient will present himself for the cure of hemorrhoids. Prolapse of the rectum and hemorrhoids often follow and are associated as a result of the constant effort to expel the mass, when low down. A prolapse of the rectum should be recognized with the finger.

Treatment. The treatment of rectal polypi is dependent

upon the number and their pathological nature. When the polypus is pedunculated and only a few in number, ligation and cauterization of the stump is the ordinary treatment. The ligature should not be too fine or so tight as to allow it to cut through the pedicle in less than three days, as bleeding from the stump is often profuse if the ligature slips off or cuts through before granulations become firm. Cauterization without ligation is a most unsafe method of treatment owing to the great liability to hemorrhage.

Should the rectum be the seat of a large number of these growths, particularly of the adenomatous type, irrigation by means of a double current irrigator made for that purpose is more suitable than the above treatment. The irrigating fluid should be of a temperature not less than 110 degrees or not more than 120 degrees F., and either of the following solutions may be used: Twenty per cent. aqueous extract of krameria; ten per cent. witch-hazel; ten to twenty per cent. peroxide of hydrogen, or plain water. A pint to a gallon of the solution may be used at one time if care is exercised to have the fluid return readily. The irrigations should be given every day for a week and later on alternating days. After a few weeks there is generally a marked improvement in these extensive growths and as the associated inflammation subsides, the irrigation may be lessened to three times a week.

When polypoid growths are located high up in the rectum or sigmoid and it is evident from their situation that irriga- tions from below would prove ineffectual, a left side inguinal colostomy or an appendicostomy is indicated which will afford the only satisfactory means of irrigating the bowel from above. At the same time, if a colostomy is the operation chosen, it will turn aside the fecal current and lessen irritation. This operation affords relief from the many symptoms of auto-intoxication and the drain upon the patient's system from diarrhea and loss of blood. The colostomy indicated under these circumstances should be of the temporary form, may be closed within from one to six months, and can be made without prolonged surgical shock or danger to the patient.

The method suggested by Gant or Tuttle, permitting the extra-peritoneal closure of the artificial anus, will be found the best, and is explained under a separate chapter.

Gibson's Valvular Colostomy is, in some cases, the only operation to be chosen, and while not affording the advantages of turning aside the fecal current, it permits flushing out of the entire colon and rectum.

It might not be inadvertent to state that recent investigations point to the opinion that polypi treated by the ligature or other surgical methods, when the base is not healed promptly, sometimes take on a malignant character.

Viewing the subject from this point it would seem that the irrigation form of treatment of all multiple polypoid growths in the rectum and sigmoid is indicated as the safest and most conservative. To advise and carry out this manner of treatment is sometimes very difficult as the speed with which surgical treatment relieves the subject is a great boon and persuasive point in favor of operation. The irrigation treatment necessarily takes months to eradicate the disease, although at the same time it relieves the underlying inflammation in the mucous membrane in which the polypoid growth originated.

CHAPTER XXI

MALIGNANT GROWTHS

CANCER and Sarcoma are classified as malignant diseases because of their tendency to infiltrate the surrounding tissue; infect the lymphatic glands and distant organs; and to recur after removal. These characteristics are in sharp contrast with those of innocent or benign tumors which do not, as a rule, infiltrate, infect lymphatic glands, or recur after complete removal, and which only prove fatal when they exist in the vicinity of vital organs. Investigations as to the cause of these malignant growths have not given us any idea as to their bacterial or pathological origin, and it still remains a question as to whether they are due to bacteria, parasites, spores, toxins, or are hereditary.

SARCOMA

Sarcoma of the rectum seems to be about as frequent as sarcoma in the small intestine, and is more often found in men than women. The disease is one of adult life but occurs in children more commonly than other malignant growths. There are several different varieties, recognized as the round cell, spindle cell, giant cell, alveolar, and mixed sarcomas. The round cell, spindle cell, and alveolar are types most frequently found in the rectum, although the other types have been recognized. Sarcoma of the rectum consists of embryonic connective tissue cells imbedded in the inter-cellular substance and varying in character. The cells are either multinucleated, or if uninucleated rarely possess a limiting membrane. The tumors contain very little fibrous tissue, being composed chiefly of embryonic cells.

The type or variety of the growth is manifested by the shape, size and the arrangement of the cells. The presence or absence of a fibrous tumor, the character of the cells and the intercellular substance give the characteristic consistence of the tumor. When there is a preponderance of the fibrous elements the tumor is spoken of as a fibrous sarcoma. All sarcomas exhibit certain similar features in their growth. They are not encapsulated and exhibit peripheral growth. They invade the surrounding tissue by progression along the tissue spaces and absorb the pre-existing tissue excepting the supporting framework around the blood vessels and capillaries. This last characteristic is a marked feature of sarcomas and is well illustrated by the vascularity of the growths.

Sarcomatous growths have certain characteristics dependent upon their histological formation. Hemorrhage within the tumor is apt to occur, and metastases along the blood stream are commonly observed, as a result of freed sarcomatous tissue in the blood vessels or lymphatics. Extension through the blood vessels is more common than through the lymphatics, dependent upon the proclivity to extend along the blood vessels.

Melanotic sarcoma of the rectum occurs twice as frequently as the non-melanotic type. Melanotic carcinoma in the rectum occurs very seldom.

The disease originates in the submucosa and produces elevations into the lumen of the gut in the form of single or multiple, round or elliptical tumors. The mucous membrane is movable over the growth during the early stages. The growths are composed of a comparatively hard tissue, but not so hard as the scirrhous cancer. In the polypoid form they resemble the adenoid polypi, which are elastic, with a firm, hard center. The disease as seen in the rectum has a decided tendency toward ganglionic infection. The lymphatics are invaded much earlier than in a corresponding growth at other portions of the body. Metastasis is therefore very apt to preclude operative interference at a very much earlier period than with cancer.

Symptoms. The nearer the anal margin the greater will be the pain, but when located high up in the rectum the pain is almost nil. The mass is globular and smooth as a rule, and not tender. There is an obstruction to the bowel movements, simulating constipation, but is less marked than in cancer, and less apt to form a stricture and cause obstruction earlier. Sarcoma is often associated with a dilatation of the bowel above the growth which allows an accumulation of the fecal matter and impaction. Ulceration from sarcoma is very late in the disease while cachexia develops early. Metastasis occurs early when the growth is soft, but later if it is a hard variety. We may have a rectal cancer remaining as a local disease for a long while, making the operative procedure much more favorable for a radical cure, by comparison, because of the tendency to metastases occurring early in sarcoma. Patients complain of fullness in the rectum first, then as the disease advances, diarrhea sets in, with pus and mucus in the stools. Often medical advice is only sought on the appearance of blood.

An intestinal obstruction is formed by the tumor pressing into the lumen of the bowel, causing an invagination or a volvulus, and not by cicatricial stricture, as in circular carcinoma.

A history of an injury at the site of the growth may be elicited in either carcinoma or sarcoma of the rectum. Malignant diseases usually are accompanied by an irregular or moderate temperature.

Diagnosis. The disease is apt to be confused with carcinoma, adenoma and fibroma of the rectum. Carcinoma has no pedicle, being situated in the epithelial layer of the mucous membrane. Sarcoma is pedunculated and can be distinguished from adenoma in not having as long a pedicle, and being firmer; but less so than carcinoma. Its attachment to the anal tissue is positively and clearly limited by its abruptness. In adenoma, the divisions, softness and extent of the growth are distinguishable features. Sarcoma is a disease of adult life, although found in children. The absence of the charac-

teristic odor of broken down carcinomatous tissue will aid in its diagnosis. Adenoma and illus growths have a tendency to irritate the bowel and produce copious diarrhea, especially when the growth is undergoing degeneration from its excessive growth. The diagnosis may be confirmed by examining pieces of the discharged tissue under the microscope.

Diarrhea with blood, pus and mucus may simply indicate the presence of an ulcer. The blood indicates the effect of the disease generally upon the system in the form of anema. There is a decrease in hemoglobin and the leucocytosis is more marked in sarcoma than in carcinoma. The urine in these subjects does not reveal any pathological chemical, or morphological elements which are of any practical value in the diagnosis.

Sarcoma almost invariably is found within the lower two and a half inches of the anal orifice and is very rarely found higher up. The disease is of much more rapid growth than cancer and has a distinct tendency to ganglionic infection in the rectum. The lymphatic glands are involved early and when the disease is located in the anal orifice the inguinal glands will be the first to become enlarged. When the sarcoma involves the rectum higher up the mesenteric or the hypogastric lymphatics will be attacked first. The growth in the rectum may itself be a metastatic deposit, due to the great tendency of this disease to their formation.

The liver, as it is in a direct line of infection through the portal circulation, is frequently the seat of secondary infection. The disease may be either primary or secondary, the latter due to metastases from growths in some other portion of the body. When hemorrhage occurs into one of these tumors the dark appearance may cause one to mistake it for the melanotic type. The melanotic change may occur in any of the different types of carcinoma by the deposit of melanin in the tumor, giving it color and causing one to mistake it for a sarcomatous neoplasm in which a hemorrhage has taken place.

Syphilitic lesions of the rectum in the form of stricture or gumma may resemble sarcoma. Syphilitic stricture is generally preceded by a long period of ulceration, while sarcoma develops within a year or two and is a hard, indurated, rapid growth which does not ulcerate until late in the disease. Gummata are flat masses which are not tumor-like nor so extensive as sarcoma; and they do not involve the adjacent organs or produce metastases. A history of syphilis obtained from the patient may clear up the diagnosis. In doubtful cases microscopic examination of a specimen of the tissue for the spirochete or the sarcomatous elements should be made.

Syphilis is usually manifested in some other portion of the body and usually the entire rectum is involved in the form of a proliferating inflammation uniformly distributed throughout the rectum. There is diarrhea from the beginning, profuse discharge of pus, mucus, little pain, the protruding mass is without indurations and is soft to the touch. Cancer more than sarcoma somewhat resembles syphilis.

Tuberculosis of the rectum, in the form of glandular swellings, are sometimes confused with lympho-sarcoma. A history of tuberculosis at some other portion of the body, or the family history of the patient, will aid in the diagnosis. Tubercular glands are slower in development than sarcoma and are more sensitive and irregular in shape.

The examination of the feces in cases of sarcoma reveals nothing beyond the peculiar shape of the fecal mass due to compression by the growth, excepting when ulceration exists.

Treatment. The treatment of sarcoma should be a radical operation, as the metastatic tendency of the growth makes it certain that by the time the diagnosis has been made, an involvement of some of the surrounding tissue has taken place. These tumors cannot be benefited by a removal of the mass by ligature, but require the same radical surgical procedures laid down for extirpation as recommended for cancer of the rectum.

CARCINOMA

Cancer unfortunately occurs more frequently in the rectum than any other portion of the intestinal canal. It is found usually in the form of the epithelial, medullary, adenoid and scirrhous varieties.

The disease does not limit itself to the anus and rectum but is commonly found in the sigmoid, splenic and hepatic flexures of the colon and cecum. The relative frequency of cancer as given by Tuttle shows that the anus and rectum are the most common seat of the disease as compared with the sigmoid flexure. His statistics, given from a collection of 1029 cases, show the occurrence of the disease in the rectum 901 times, and in the sigmoid flexure 128 times. A final comparison as to its relative frequency in the rectum in the sexes; the males are more frequently affected and the prognosis more unfavorable than the females.

Epithelioma occurs in the form of the squamous variety, chiefly at the mucocutaneous border of the anus, and does not differ materially in appearance or histologically from similar growths in the skin or mucous membrane which are covered with squamous epithelium in other portions of the body.

Epithelioma begins as a rule in the superficial epithelia or the glands about the anus, but may have its origin in a fissure, ulcer, cicatrix, abrasion, or growth in that region. It may manifest itself as a dry, hard, wart-like nodule or a sharply defined ulcer with firm infiltrated edges. Ordinarily it does not ulcerate until late and assumes the former type. The growth may extend upward, involving and destroying the skin, fasciæ, muscles or other tissue as it progresses. Commonly squamous epithelioma about the anal orifice progresses slowly, causing so little pain or other disturbances at first that the sufferer does not recognize the existence of the growth for months. This may be varied in exceptional cases by the disease progressing rapidly so that the nature of it becomes evident in a short time.

The superficial type does not involve the lymphatics in so

short a time as the variety situated higher in the rectum. In some instances when the growth attacks the skin the ulceration extends to the perineum and scrotum, or may extend farther, involving the skin of the surrounding organs. The ulcerated surface may be fissured or assume the appearance of cauliflower excrescences. One of the chief characteristics, however, of the ulcer is the tendency to persist; while healing may take place in some portions the ulceration and cell proliferation continues in another direction. Often there may be a slight healing on one side, with the formation of glistening scars.

Histologically, the superficial squamous-celled carcinomata are composed of small epithelial cells, which, when of the deep-seated variety, are large, flat, and small. When of the latter variety, the masses of cells extending from the superficial layer into the deeper structures present a concentric arrangement, resembling epithelial coils.

Medullary *(Soft Cancer)*. These growths are characterized by an abundance of epithelial cells, with a slight amount of stroma, poorly supplied with blood vessels and presenting a slight resemblance to brain substance. This type of carcinoma is quite common in the rectum, is of rapid growth and very malignant. It grows so rapidly that it sometimes becomes so large as to completely fill the pelvis. It has a decided tendency to involve the lymphatics early and recur within a short time after operation, when not completely extirpated. The tumor presents the difficulty of demonstrating the stroma on microscopic examination, and is a soft, vascular and juicy tumor, which upon scraping or squeezing expresses what is called " cancer milk " or juice.

Adenoid *(Malignant Adenoma)*. These growths bear a close resemblance to adenoma in the production of gland-like histological formations, which resemble the normal epithelial structures of the bowel. The growth is made up of glandular recesses lined with tall columnar cells similar to those of the Lieberkühn follicles, and imbedded in a dense connective tissue stroma. This form of malignant disease of the rectum

is the most difficult with which the surgeon has to contend and is therefore one of the most important of these malignant diseases. During its early stages or incipiency this type bears a close resemblance to adenoma, producing a gland-like tumor which very frequently undergoes a transition into carcinomatous tissue, and is therefore frequently described as adenocarcinoma.

This variety of carcinoma is encountered more often at the anterior and posterior commissures than in the lateral walls of the anal canal, originating in the mucous membrane of the tubular glands or the crypts of Lieberkühn. When the connective tissue formation predominates about the tubules it assumes a greater or less degree of permanence. If the epithelial elements predominate the tumor grows more rapidly than when the connective tissue or stroma are in excess. This epithelial or atypic type is most common and the rapid proliferating cell formation completely obliterate the newly-formed tubules.

Progression of cylinderic-celled carcinoma takes place either by proliferation of the cancerous elements throughout the entire bulk of the tumor, or by transformation of the healthy mucous membrane into neoplastic tissue at the margin.

The arrangement of the blood vessels and lymphatics around the lower bowel tend to permit the columnar-celled carcinomata to grow more rapidly in the lateral than in the vertical direction and it is apt to encircle the gut in the form of a stricture.

These tumors are hard or soft, depending upon the predominance of the epithelial or connective tissue elements respectively. Ulceration and the breaking down of the tissue takes place from the formation of fistulous sinuses and diminution in the lumen of the bowel. The discharge of blood and broken-down tissue result from abrasions, ulceration, and the sinuses formed about the mass.

Scirrhous *(Hard Cancer)*. This variety of cancer is the least frequent, less malignant and is slow in its growth. It is composed of a dense, fibrous stroma and epithelial cells, is

tough and bears a resemblance to a cartilaginous or raw potato-like material on section. The tumor has few blood vessels in the dense central portion but more in the periphery. The tumor is recognized by the great preponderance of connective tissue, and the relatively small number of epithelial cells contained within the alveoli and the tendency of the cells to undergo degeneration early. Clinically, these tumors appear in the form of a contracting stricture of the rectum, causing very little pain, hemorrhage or discharge. A gradually increasing constipation is the most important symptom. Anemia and sepsis are absent until intestinal obstruction or rupture of the gut supervenes.

Symptoms. At first the patient complains of weight and fullness in the rectum or pelvis when the growth is high up, associated as a rule with very little pain; but if the growth is situated low down in the anal canal the pain is an early symptom, undoubtedly caused by the abundant nerve supply of that region. The involvement of the sphincter muscles causes a tenesmus as the disease progresses. There is a frequent desire to expel the mass. Constipation is a marked symptom when the growth is high up. Blood, pus, and mucus are found in the stool when the ulceration is marked. Stricture of the rectum from carcinoma will sometimes produce the only symptoms of any disorder in that region.

During the early stages of malignant disease of the rectum the symptoms are usually attributed to some ordinary disturbances of the intestinal tract in the form of a diarrhea or constipation, as there is apt to be no pain, bleeding or discharge of mucus and the only symptom is that of a sensation of a fullness in the rectum which interferes to a slight degree with the normal evacuation of the bowel. As the disease progresses a feeling of fullness and weight at the location of the growth or in the pelvis becomes more pronounced. Pain which is referred to the sacrum, coccyx, or radiating down the limbs becomes constant in character. Later the patient complains of hemorrhoids, fissure, ulcer, a discharge of mucus or blood and a desire to empty the bowel at more frequent

intervals. Constipation supervenes, alternated with diarrhea during the same day or at intervals of several days. The sufferer may begin the habit of emptying the bowel during the period of constipation with enemata. The mucus discharge, with blood, becomes more frequent and profuse, almost invariably causing alarm sufficient to warrant seeking medical advice at this late period of the disease. The discharge has a foul odor characteristic of the disease. The anal margin may become so irritated from the discharges that vegetations, excoriations and elongated tags of skin cause an intense pruritis.

The pain from cancer of the rectum which exists high up seldom causes much suffering until the growth encroaches upon the nerves located in the pelvis, and when it has assumed such a size as to cause obstruction. Disturbances of the bladder and involvement of the nerves supplying the pelvic organs and the legs are constant symptoms. The retention of fecal matter and gases above the obstruction cause symptoms of colic. Tenesmus is almost a constant symptom of the disease, when located around the anal margin, on account of the direct involvement of the sphincter muscles. Edema of the legs, ascites, intestinal obstruction, fecal vomiting and rupture of the intestine above the obstruction are common symptoms during the latter stages of the disease. The involvement of the uterus, vagina, and the destruction of all the surrounding tissue becomes almost inevitable as the disease progresses.

Diagnosis. The proctoscope and sigmoidoscope may be of service in these cases, but should be used with the greatest care and by an experienced person only for fear of rupturing the bowel. This disease illustrates most emphatically the necessity of an early examination by the physician. Cases in adult life presenting themselves for the treatment of chronic diarrhea associated with the discharge of pus, blood, or mucus from the rectum, or those giving the symptoms of rectal obstruction associated with pain or a sense of fullness in that region, are referred to the surgeon, as a rule, only after the disease has progressed so far as to make the chance of radical

cure very uncertain should the diagnosis show cancer or sarcoma. The great mortality after operations for cancer and sarcoma of the rectum will continue until the chances for early operation are afforded more often.

Carcinoma is most likely to be confused with sarcoma for the reason that it extends over a long period and appears chronic in its course. One fully realizes that the patient is suffering from a disease that has been irresponsive to treatment.

Sarcoma occurs quite often in children, but cancer is a disease of adult life, with few exceptions. Cancer tends to ulcerate early and involves the surrounding tissue, making its outlines very much less definable. Sarcomatous metastases in some instances occur early, but the tumor does not involve the surrounding tissue as would occur at a corresponding stage with cancer. Cancer of the rectum in the majority of cases presents a circular, ulcerated, annular stricture at the time of examination. The examiner may easily determine the shape and the ulcerated condition of the growth, but attribute the condition to an ordinary catarrhal stricture of the rectum and hesitate about a microscopic examination of the tissue for diagnosis. One should remember that stricture from any other cause, unless associated with an abscess or fistulæ from an inflammation, does not undergo ulceration and that the intestine may be almost completely obstructed before there would be sufficient traumatism to cause ulceration and degeneration of the constricting band.

Lypomatous and fibromatous tumors of the rectum are slow in their growth and do not produce systemic disturbances, as cachexia or metastasis. They can hardly be confused with sarcoma or carcinoma of the rectum. Tuberculosis and inflammatory deposits are more apt to confuse one in the diagnosis of malignant growths of the rectum than any other disease, and a specimen of the tissue should always be promptly subjected to microscopic examination for diagnosis. Examination of the feces in growths of the upper intestine infrequently prove of value.

The disease may be confounded with proliferating procti-
tis (syphilis), sarcoma, papilloma, multiple adenomata and
fibrous stricture of the rectum or sigmoid. Multiple adeno-
mata and papillomata are very prone to a malignant trans-
formation and are wisely treated from the beginning as car-
cinomatous. The same may be said for sarcoma, being ma-
lignant in character the prognosis is quite as bad. Syphilis
should be differentiated from this group of diseases by mi-
croscopic examination of the tissue involved. This disease is
generally manifested by syphilitic disease at some other por-
tion of the body. It usually appears in the form of a pro-
liferating disease of the entire rectum with the discharge of
pus and mucus in great abundance. The protruding granu-
lations are not indurated and are soft to the touch. The
pathognomonic odor of cancerous discharges from the bowel
may further aid in distinguishing the disease from syphilis.
A specimen of the growth may be obtained by means of the
nasal scissors or with the specimen forceps. The latter cuts
out a piece of the tissue with the two elliptical spoons which
form its cutting ends. A piece of tissue may be obtained
through the sigmoidoscope at a height of twelve inches with
this instrument.

The differential features of adenoma, papilloma, and cancer
are briefly enumerated as follows:

ADENOMA	PAPILLOMA	CANCER
1. Adults usually.	1. Seldom in childhood. Adults and old age common.	1. Usually adults and old age.
2. Female more frequently.	2. Neither sex more frequent.	2. Men more frequently.
3. Covers large areas, sometimes entire colon.	3. One, two or three in number close together.	3. May involve entire rectum but is generally limited.
4. Size of tumors may vary, seldom coalesce.	4. May be very large in size.	4. Indurated base and entire thickness of the bowel.
5. Normal mucous or submucous attachment to rectal wall.	5. Superficial attachment to rectal wall having pedicle and indurated base.	5.

ADENOMA	PAPILLOMA	CANCER
6. Hemorrhage and diarrhea early symptoms.	6. Glue-like mucous discharge. Blood irregularly discharged, constipation more often than diarrhoea.	6. Constipation in early stages, diarrhea later, mucus early and pus with blood later.
7. Elastic and soft to touch.	7. Villous, shaggy, and soft to touch.	7.
8.	8. Exhaustion and anemia quite early.	8. After ulceration constitutional symptoms appear.
9. Odor not unusually offensive.	9. No marked odor.	9. Odor pathognomonic.
		10. Extension takes place by metastasis, by continuity and through the lymphatics.

An exploratory laparotomy is often justifiable in cases of cancerous involvement of the upper portion of the rectum or sigmoid for the purpose of ascertaining the nature of the growth or the possibility of its removal. The practice of introducing the entire hand within the rectum to discover the size, limitation, or fixation of such growths is not justifiable in view of the fact that modern instruments for the examination of this organ have proved most perfect. When the abdomen is opened a knowledge of the possible involvement of other organs should be attained at the same time. The liver, uterus and the lymphatic glands should be carefully examined. The incision for an exploratory laparotomy in all instances should be made in the same locality as for a colostomy, so that, should it be found necessary from the conditions of either of these organs, an artificial anus may be made at once.

By such means the uselessness of any attempt at removal of the growth in the rectum or sigmoid may be positively determined and relief afforded at once. This procedure is practically without danger.

Treatment. Malignant growths of the rectum and anus require radical treatment at the earliest possible moment as the safest line upon which the surgeon may direct his effort for

permanent cure. There is no doubt that as our diagnostic
ability improves results will be more gratifying. The radical
operation for these cases should in all instances be advocated
at the earliest possible moment to give these patients the one
chance for enjoying the ordinary five-year limit. Cases that
have extensively involved surrounding organs, making it very
evident that an operation to remove these would sacrifice
life, are not included in operable cases and are only subject
to amelioration of their sufferings.

The treatment of cancer in other portions of the body by
sera and violet rays has not proved satisfactory in cases
of rectal malignancy, and it is with great expectation the
surgeon is awaiting developments in this field that such treat-
ment may be applied to these cases.

Chemical Caustics. The application of chemical caustics
and thermocautery in this region are of little value, as the great
pain which follows such treatment make it unadvisable. A
curettement will sometimes relieve the bowels by removing
the necrotic tissue, but it does not in any way help to relieve
the character of the growth and, therefore, is only temporary
in its relief.

Inoperable Cases. Cases that are inoperable for radical
methods can be made more comfortable by a left inguinal
colostomy, as the irritation to the parts is relieved by turning
aside the intestinal current, giving relief from the pain, diar-
rhea, fecal impaction and obstruction, besides affording an
opportunity to irrigate the diseased intestine. The operation
is attended with little danger and the patient is allowed sev-
eral months of quite comfortable existence.

Forcible dilatation or divulsion requires a general anes-
thetic; is performed, as a rule, to relieve impaction and per-
mit, for a short while, regular evacuations of the intestine,
but it is attended with so little comfort and danger of ruptur-
ing the bowel, that it is not recommended excepting when
the growth is in the anal canal.

Extirpation is indicated generally when the growth is mov-
able and does not involve other organs, if no ganglionic in-

volvement and metastasis has occurred, and when the patient's condition can withstand the surgical shock.

When the remote lymphatics and other organs and the pelvic bony structure are involved with low physical condition, rapid pulse, cachexia and fever, the extirpation of the growth is contraindicated. When the digestive apparatus is markedly disturbed, recovery after extirpation is greatly interfered with, due to the continued low vitality and the inability to assimilate blood.

In some instances, however, the liver or other organs may be diseased from some other cause; the growth may be adherent to adjacent organs or the lymphatics enlarged as the result of a simple inflammation and not involved in the malignant disease. When the growth is adherent to the prostate gland or seminal vesical, an extirpation of part of these organs with the growth can be made, with expectations of radical cure.

The prognosis is much more favorable in adenoma and scirrhous carcinoma than in the medullary and squamous varieties. The question of informing the patient as to the true nature of the growth is probably best decided by the physician as circumstances and the mental stamina of the individual are to be considered. When the chances are greatly against a successful termination and palliative measures, such as a colostomy, are rejected, it then becomes almost our duty to inform the patient as to the nature of the disease. It gives the only chance for a prolongation of life, which otherwise may terminate after a long period of misery and suffering.

Palliative Treatment consists of antiseptic and astringent irrigations, cauterization, drugs, curettement, and surgical procedures for the escape of the bowel contents.

The diet should consist of beef, lamb, chicken, eggs, milk, broths and cereals. Sugars, fibrous vegetables and uncooked starches should not be given later in the disease, as the undigested residue of this class of foods act as irritants. Milk diet alone causes hard, irritating, fecal masses and for that reason should not be advised.

Irrigation of the diseased area, particularly when the growth has undergone ulceration, becomes an absolute necessity, on account of the odor, for the patient as well as those in attendance. The irrigation relieves the hard fecal accumulation above the mass and the irritation due to the diarrhea. Solutions of five per cent. boric acid; hydrastis, one per cent.; aqueous fluid extract krameria five per cent.; bichloride mercury 1-10,000 or carbolic acid one to one hundred, are most satisfactory for this purpose. The solution may be sprayed upon the site of the growth, when low down, or when higher up the double current irrigator may be used, with the patient lying upon the side, or in the knee-chest position. Should the fluid not empty the bowel with the aid of the ordinary rectal irrigator, a small Wales bougie may be introduced through the constricting band and the small nozzle of a fountain syringe inserted into the hollow of the bougie to carry the irrigation to the desired point. The bougie should be introduced by the physician or an expert nurse so as to avoid the danger of rupturing the bowel at the site of the growth. Patients often gain flesh and strength under this diet and antiseptic treatment, and are certainly made much more comfortable.

Drugs can do no more than add to the comfort of these sufferers. Intestinal antiseptics which control digestive disturbances, and stimulation in the form of strychnine are indicated. Morphine or opium should not be employed until the patient suffers from severe pain, as the diarrhea can be as easily controlled with the irrigation. Opium will disturb the digestion and interfere with excretions.

A curettement is indicated when the growth is soft and situated upon the posterior wall of the rectum, and particularly when the loss of blood is a constant drain upon the system. The wound should be irrigated with hot or cold water after the curettage and a drainage tube inserted and retained for a few days. This procedure will accomplish quite as much in some cases as an artificial anus. When the growth involves the anterior walls of the rectum there is great

danger of penetrating the peritoneal cavity while curetting. Iodoform gauze to control the bleeding is likely to cause toxic symptoms when left in the rectum.

Cauterization for controlling the bleeding and to enlarge the lumen of the bowel at the site of the growth is likely to cause peritonitis through radiation of heat or the actual penetration of the bowel wall. It is much better, when possible, to clamp the excrescences with the ordinary hemorrhoidal clamp, then cauterize with the Paquelin cautery. Chemical cauterants are dangerous because of our inability to definitely control their action.

The surgical palliative procedures are intended to serve the same purpose as colostomy, relieving the bowel of its contents without helping to interfere with the progress of the growth.

An end-to-end anastomosis may be performed when the diseased mass is located in the sigmoid flexure, which permits enough free gut to be brought out of the abdomen to properly manipulate it in making the anastomosis. The operator intentionally leaves the diseased segment with its mesenteric attachment *in situ*, and anastomoses the two free ends of healthy gut.

Lateral Anastomosis may be employed in cases where the tumor is situated high up in the rectum, above the levatores ani, or in the 'sigmoid flexure. There must be sufficient healthy gut to permit an anastomosis below the growth.

The Three-Step operation in tumors of the sigmoid colon, originated within the past year by the late James P. Tuttle of New York, is a most ingenious and safe procedure for the extra-peritoneal excision of neoplasms and tight strictures of the sigmoid, or to effectively treat a severe case of diverticulitis. He emphasizes the great danger of infection and death from resection by end-to-end or lateral anastomosis, and claims to have had no deaths in four cases operated upon by him by this method.

He assumes that the growth is above the recto-sigmoidal junction and movable, otherwise the operation is impracticable

from the present standpoint of his experience. The technique written by Tuttle in the *Proctologist* of September, 1912, is as follows: " The incision is made through the outer margin of the left rectus muscle; we make this incision because if it
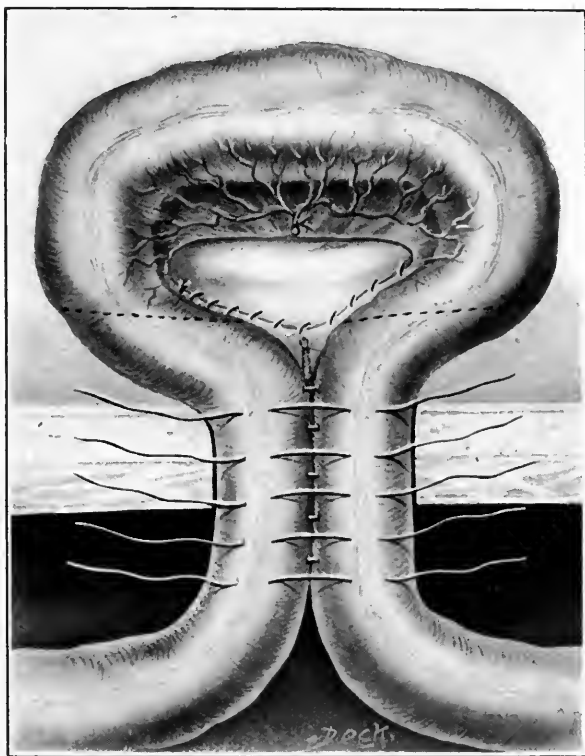
Fig. 71. Tuttle's three-step operation. Sigmoid with tumor on abdominal surface. Shows peritoneal layers of meso-sigmoid cut and sutured over leaving no raw surface in abdominal cavity. Two layers of sutures are used to bring the two legs of the sigmoid into apposition.

proves impossible to remove the growth it is one of the best incisions for the exit of an artificial anus. Care should be avoided not to wound any of the large veins that run along this region. The abdomen having been opened by an incision three or four inches long in order to give plenty of working

space, the patient is placed in Trendelenburg's posture, and the small intestines are lifted out of the pelvis and packed up as high in the abdomen as possible. The sigmoid is then caught and pulled out of the abdomen; the peritoneal covering of meso-sigmoid is slit along for a distance well above and below the tumor (Fig. 71); this incision should be made on each side and rather close to the gut itself; the peritoneum is then peeled back to the posterior abdominal wall or rather to the crest of the ilium.

" *The blood vessels* and their containing cellular tissues and glands are exposed, and the loosening of the peritoneal bands will allow the gut to be brought out upon the abdominal wall. All glands and fatty material around the blood vessels supplying the part of the gut which is involved in the growth are pulled or milked away toward the gut, thus exposing the blood vessels. The artery and veins can then be clearly seen, and the main vessel supplying the involved portion is cut and tied in two places, as will be seen in Fig. 71. The gut is thus loosened and can be pulled out of the abdominal cavity. The stump of the blood vessels is pushed back between the two peritoneal layers of the meso-sigmoid; these two layers are stitched together, thus covering up all the nude surface in the peritoneal cavity. The two legs of the loop of the sigmoid are now brought together by one row of sutures running along the border of the mesentery, well down to the peritoneal cavity; they are then rotated on themselves and another row of sutures is run the same level along through the long muscular bands of either leg down to the peritoneum as before, thus bringing the flat surfaces of the gut together.

" The peritoneum is now stitched around the two legs, with the tumor brought well outside the abdominal cavity, and after this the gut is stitched to the skin; it is then covered with rubber tissue and left *in situ* from 24 to 72 hours, according to the condition of the patient. If there is any indication of obstruction a puncture can be made in the upper loop allowing the gas to escape, or, if gangrene should be imminent in the loop exposed, there is no reason why it should not be

excised any time after 18 hours or less. In my second last case I excised the growth in 20 hours after the operation, without any complications. When the gut is excised it should be done by a V-shaped incision, as in Fig. 72, in order that there may be abundant material for bringing the ends together at a later period.

"It will be observed that having tied off the main blood vessel supplying this loop there will be little or no hemorrhage
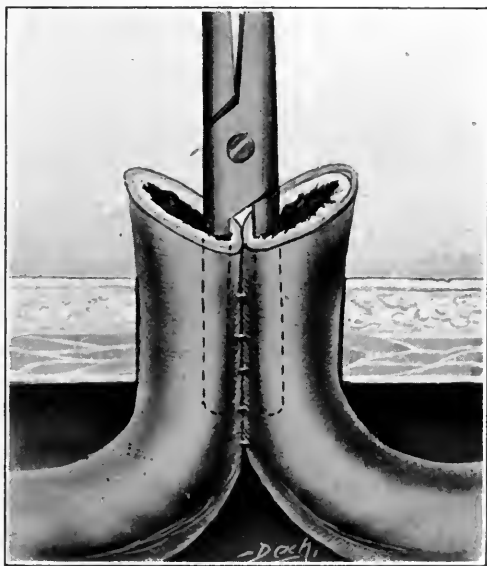
Fig. 72. Tuttle's three-step operation. Second step
—clamp in position to cut away spur.

and no pain in this resection; and there is no danger of peritoneal infection, as this cavity will have been closed off after the first five or six hours. Four or five days, almost a week, should elapse before the clamps are put in to cut away the spurs. I use a Pryor's hysterectomy clamp, and introduce it well down into the two legs of the artificial anus; it takes from three to seven days for this to cut through before the forceps come away; I then introduce through the rectum a No. 8 Wyeth modified Wales bougie, passing it up beyond

the artificial anus. Its tip will usually come out of the artificial anus. but it can be reintroduced and carried into the upper leg of the spur. Its elasticity will press the spur backward and cause the mouth of the artificial anus to roll inward. This bougie is left in for two hours, three times a day, until
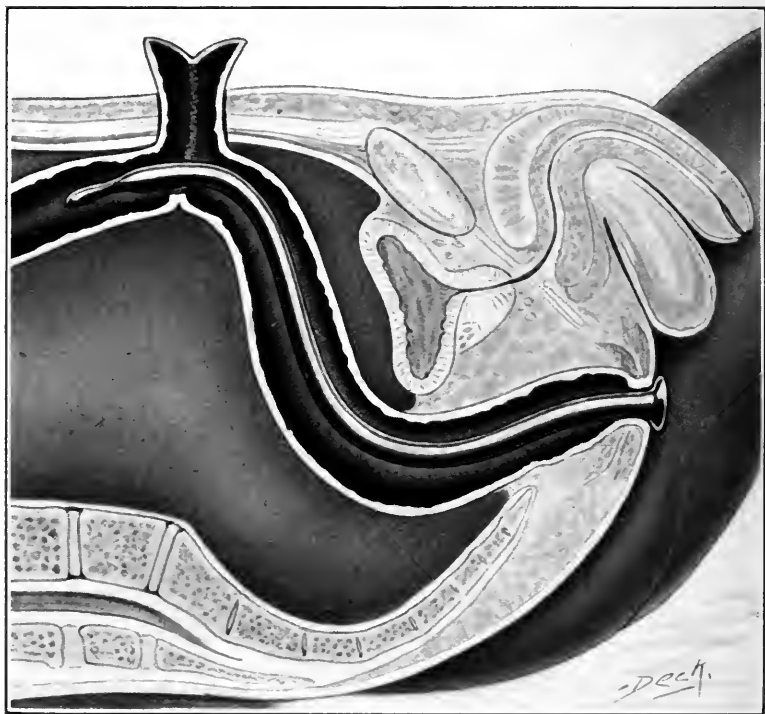
Fig. 73. Tuttle's three-step operation. Crushing spur and widening lumen of gut with soft rubber Wales' bougie.

the wound caused by the cutting away of the spur has healed, thus giving a wide aperture for the passing of fecal material downward.

" The next step consists of dissecting the edges of the artificial anus away from the skin and the fascia of the abdominal wall down to the peritoneum; the aperture in the gut is then

sewed up by one row of through-and-through sutures and one of Lembert's; these must be carefully placed, the first being of silk and the last of fine chromic gut — this being accomplished the peritoneum is stripped from the abdominal wall for about a half an inch all around the wound; the cicatricial tissue and fascia is trimmed away and three or four double anchoring sutures threaded upon agate buttons are passed across the wound and out upon the skin upon either side, to about one inch away from the margin of the wound. The buttons serve

Fig. 74. Tuttle's three-step operation. Third step— closure of artificial anus and abdominal wall.

as bases for the sutures to rest upon and prevent their cutting into the skin, and render them much less painful than the ordinary sutures; and if the wound should gape one can twist the button like a tourniquet and bring the parts close together. After the sutures have been tightened, an ordinary subcutaneous suture is used to bring the skin together.

"It is not presumed that every one of these cases will heal perfectly without a small fecal fistula, but in time they will all close up. The operation is not so brilliant as that of end-

to-end or lateral anastomosis when these succeed by primary union; but it is much safer, in fact, barring some unforeseen accident, I see no reason why we should ever lose a resection by this technic. It is slower, to be sure, and the patients chafe under the artificial anus during the first step, but when they learn the conservatism of the method and the great risk avoided, they are well satisfied."

Posterior Proctotomy is indicated when urgent symptoms of obstruction exist, and may be performed when the growth is located in the lower three inches of the rectum. External or complete proctotomy consists in making a complete incision through the growth, sphincters, and all the tissues backward to the coccyx. Internal proctotomy is performed with less shock and bleeding if care is exercised to limit the incision. The incision should be made with a probe-pointed knife, which is carried above the mass and afterwards drawn down through the growth, cutting deep enough to relieve the obstruction. The growth should never be incised anteriorly for fear of injuring the adjacent organs. Sometimes, particularly when cutting from within the growth, several incisions may be necessary in the posterior lateral walls. The wound should be packed tightly for at least twenty-four hours to prevent hemorrhage and the lumen kept open by passing a Wales bougie of soft rubber two or three times each week.

Dilatation by forcible means requires the administration of a general anesthetic. Since the procedure takes very little time, ethyl chloride is very satisfactory for this purpose. The fingers make the best and safest dilators, as the condition of the growth is easily recognized and large tears avoided. Dilatation will also necessitate the after-treatment with bougies and the careful regulation of the bowel movements to a soft consistent mass. Impaction very quickly follows the smallest arrest of fecal matter.

Radical Treatment. The radical treatment aims to remove the growth and involved structures in their entirety. This procedure is the only one which offers the patient any hope of permanent cure and should be advocated at the earliest possi-

ble time. Statistics lead us to believe that one out of every five cases survive the time limit for recurrences, and when we consider that death eventuates in every case unless operated upon, it seems that the chance should be advised. The radical operation deals with those cases involving the mucous membrane of the anal canal and rectum and which do-not include the skin of the anal margin. The operations for the radical removal of malignant growths of the rectum are almost innumerable and history covers the gradual evolvement of our modern operations for this purpose.

The Kraske and Lisfranc's operations for the radical removal of rectal cancer have been modified to meet modern ideas since their originators first described them, so that all our present day operations still bear a great resemblance to either or both.

Kraske's operation and operations which advise the removal of portions of the sacrum are less frequently advised. It has been found that the rectum and an operable cancer can ordinarily be enucleated by means of an anterior and posterior proctotomy as readily as with the removal of a portion of the sacrum, unless the hand of the operator is very large. When we consider the advantages of the combined operation even the modified Kraske operation seems to be useless, unless one is forced to make a sacral anus.

The combined operation for the removal of malignant growths of the rectum is probably the best. This procedure includes an abdominal route which allows one to enucleate a part or the entire mass; permits the descent of the rectum to the desired depth by detaching all of its mesentery; safeguards the circulation above the growth by cutting the superior hemorrhoidal artery, and also allows the descent of the rectum without overstretching the sigmoid. The perineal route is then made use of for the final extirpation of the growth.

Hartmann points out that there is a space just above the recto-sigmoidal junction poorly supplied with blood vessels. These vessels are apparently without any anastomosing branches. This space seems isolated, as the gut below this

area is supplied by the superior hemorrhoidal and above by the lower sigmoidal arteries. The superior hemorrhoidal artery sends its terminal branches directly downward, anastomosing with one another but not with the branches of the lower sigmoidal from above. Therefore, if the superior hemorrhoidal is cut above its distribution to the rectum, the amputated gut between that part formally supplied by it and the portion above, so sparsely supplied by the sigmoidal artery, will have an insufficient blood supply, which is very likely to result in a slough and retraction of the gut. This deficiency may, in other instances, terminate in suppuration, with death, due to infection of the peritoneal cavity.

The question arises in every instance where cancer is located above the floor of the pouch of Douglas as to how we may provide for proper circulation in that section of the rectum intended to take the place of the cancerous portion removed. The perineal route confines one to the sense of feeling in distinguishing the pulsating arteries. Therefore it is almost impossible to avoid tearing off the superior hemorrhoidal artery while enucleating the rectum, when the growth is situated higher than three inches from the anus. This study of the circulation explains some of the disastrous results obtained after the most careful technique in the operative procedure following amputation within this segment of the gut by the abdominal route; or when the rectum is pulled upon to such an extent as to interfere with the proper blood supply from the superior hemorrhoidal artery in performing the perineal excision. The combined operation offers through the abdomen a clearer conception as to the limit of the perineal work, and, at the same time, discloses the extent of gut involved in the growth, in order that the amputation be made with a degree of assurance as to its nutrient blood supply. To sum up the advantages: It affords an opportunity to examine the adjacent organs, glands, and the metastases; allows a possible curettement; removal of glands; permits one to tie the superior hemorrhoidal artery above its junction with the sigmoidal artery, and permits stretching of the gut below this

point to prevent strangulation from tension. Finally it allows the surgeon to cover up all the denuded surfaces; restore the meso-sigmoid to prevent retraction and prolapse; and to close the peritoneal cavity before beginning a perineal enucleation.

The abdominal incision also permits one to resort to an artificial anus, if the growth presents such conditions as to not warrant total extirpation, or if the sigmoidal attachments will not permit it to be carried down to be sutured at the normal position of the rectum.

It is very probable that many failures have resulted in death or stricture after the perineal excision from the tearing off the blood vessels; or if by the abdominal route, from tying off a number of blood vessels within the mesentery as the gut is loosened from its attachments to the sacrum, without regard to the loss of blood supply.

The combined operation was first suggested by Mounsell in 1892, but literature does not give us any account of any effort on his part to safeguard the circulation. He simply loosened the peritoneal attachments of the gut above and below the growth and then passed a tape around the mass, through the gut and out through the anal opening, which permitted him to pull the neoplasm out by this route.

Weir modified this method because the forcible traction upon the tape spread the opening in the bowel through which it passed and allowed the fecal matter to escape into the peritoneal cavity. He ties the inferior mesentery artery at the promontory of the sacrum, frees the rectum and sigmoid down to the tip of the coccyx posteriorly and to the lower border of the prostate anteriorly. Below the tumor two iodoform tapes are tied around the gut at a distance of about one inch apart and the gut cut between them. The neoplasm and the upper portion is drawn out through the abdominal wound and the growth is removed. The rectal end of the gut is then everted through the anus by an assistant with forceps. Through this everted portion of the rectum a long forceps is carried into the pelvis, and the upper bowel grasped and drawn down through the everted rectum. Both ends of the

lower and upper segment of the gut are then sutured together. To hold the parts from retracting, fixation needles should be passed through the invaginated ends before beginning to completely suture these ends. The parts are then restored to their position after the removal of the needles.
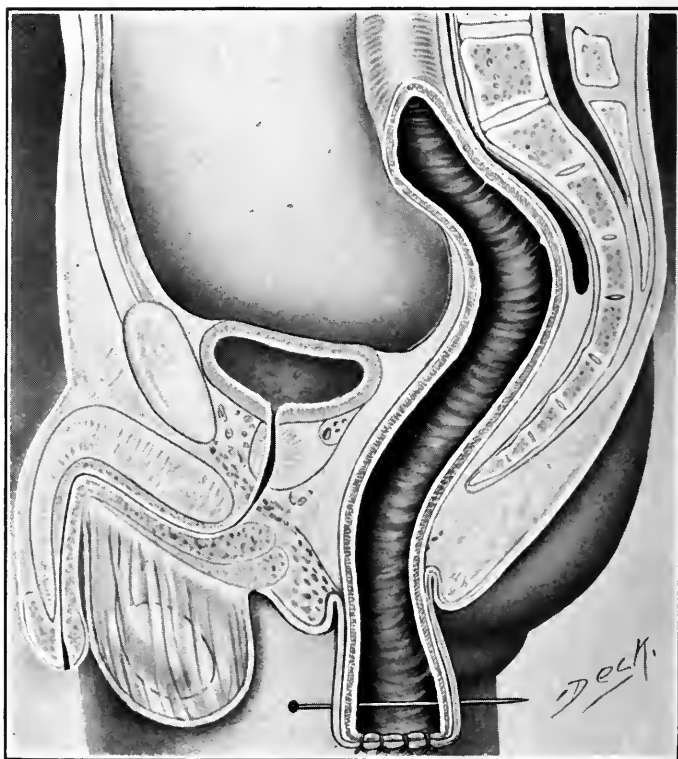
Fig. 75. Abdomino-anal extirpation. Weir's method—sigmoid sutured to everted rectum.

The peritoneal cavity is closed, and afterwards the abdominal wound. He completes the operation by an incision posteriorly to the anus, extending into the pelvic space to the former position of the tumor, to allow drainage through a rubber tube. He also introduces a rectal tube wrapped with iodoform gauze

to permit the escape of gas and prevent the bowel contents from coming in contact with the line of sutures.

Preparation of the patient for the combined abdominal perineal operation. Patients often present the symptoms of toxemia, the result of prolonged partial intestinal obstruction associated with bacterial infection at the site of the malignant growth. The changes which take place in the blood and tissue from the toxemia produce in their turn, anemia, debility and loss of flesh. Thus some attempt should be made to relieve the over-burdened system by clearing the intestinal tract, and by forced feeding to improve the vital force necessary to withstand the operative shock. Ordinarily a week should be taken for accomplishing this task which should include the feeding of the patient at four-hour intervals. A mixed diet of meat, milk, broths, cereals and bread is superior to a milk diet on account of the constipating effect of the latter. The mixed diet is more easily digested and permits forced feeding, thereby aiding in keeping the intestinal tract in proper condition. While the patient is undergoing forced feeding, a laxative should be given each day to produce two or three loose movements to offset intestinal auto-intoxication and relieve the system of its previous evil effects. Disinfection of the intestinal canal may be produced by the administration of either of the following well-known drugs: suiphocarbolate of zinc, two and a half grains; salol, ten grains; naphthaline, fifteen grains in capsules; or naphthol, ten grains. Either may be given three or four times a day.

During the four days previous to the operation the rectum should be washed out through a double current rectal irrigator three times a day with one of the following solutions: bichloride of mercury, 1-5000; permanganate of potash, 1-1500; or peroxide of hydrogen, three parts of sterile water to one part of peroxide of hydrogen.

The day previous to the operation and after the ordinary preparations have been made, the perineum and sacral region should be dressed with a soap poultice for two hours, then removed and the parts again washed, and finally a bichloride

dressing applied to be retained until the patient is anesthetized the following day. To further assist in an attempt to free the parts from bacterial life, the rectum should again be irrigated just before the operation, through a double current rectal irrigator, with a three per cent. solution of formalin, which should be wiped out. After this two or three ounces of pure peroxide of hydrogen should be injected into the rectum, above the tumor if possible. This procedure is intended to sterilize the parts should it be necessary to introduce the finger into the bowel, or it becomes necessary to perforate it in order to secure an invagination. Every effort should be made to lessen the dangers of bacterial infection in this region, and it might be well to emphasize here, that such precautions should be rigorously instituted in all rectal operations which may inadvertently involve the peritoneal cavity.

The technique of the Tuttle abdominal-perineal operation is as follows:

The Trendelenburg position is advised, to facilitate a clear view of the rectum and lower sigmoid in the abdominal cavity as well as to prevent the encroachment of other parts of the intestine into the field of operation. An incision is made on the outside of the left rectus muscle, beginning just below the umbilicus and extending within two inches of the symphysis pubes. This incision should avoid, if possible, the inferior epigastric vessels and injury to the bladder. After the abdomen has been opened a search may be made for metatastic involvement of the lymphatics and the location, extent, and the degree of involvement with the neighboring organs observed. Tuttle emphasizes that adhesions to other pelvic organs do not mean a malignant involvement of them and claims that some of his best results have been obtained in cases where the bladder and prostate have been attached to the growth, and further, that enlarged lymphatics do not always mean involvement in the pathological process. When adhesions plainly demonstrate the spread of the disease to the uterus and its appendages, these organs should be removed before operation upon the rectum, as it gives more room for that particular work, without adding too much to the entire operation.

Treatment of the sigmoid mesentery. After determining the extent and involvement of the growth, a point is selected about two inches above the tumor, so as to allow that much extra tissue to make a new rectum after extirpation of the
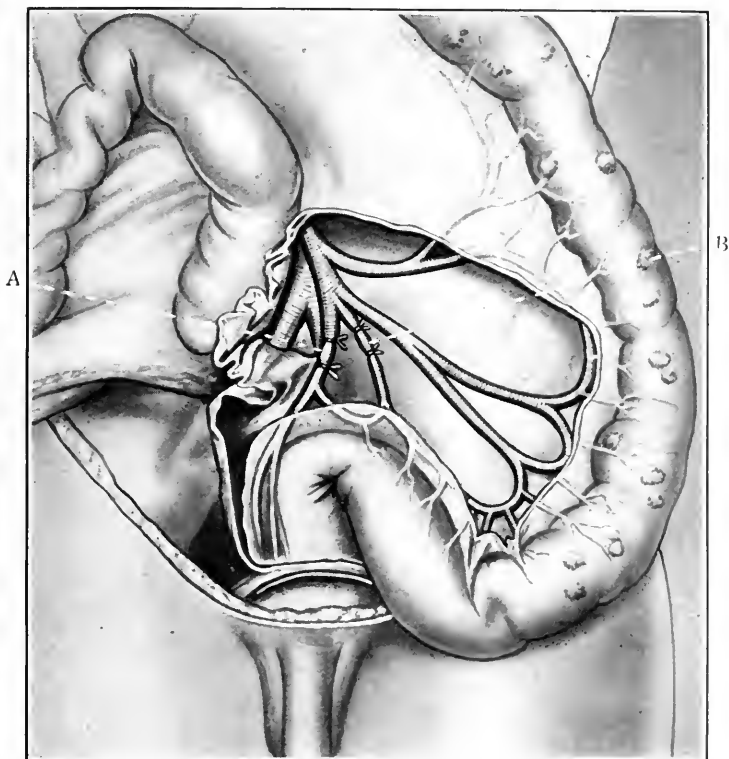
Fig. 76. Showing mesentery of sigmoid and the exposure of the blood vessels by lifting up the layer of peritoneum. A, superior hemorrhoidal artery; B, lower sigmoidal artery.

growth when the sigmoid is brought down. A small incision is then made in the peritoneal layer of the mesentery, about one-half inch from the margin of the gut. A small director is introduced into this incision to act as a guide and the peritoneum is cut parallel with the gut down to the growth. The process is repeated on the other side of the gut by simply

turning it over. The peritoneum is then stripped back on both sides of the gut to its attachment on the posterior abdominal wall. After these attachments have been loosened it allows one to drag the gut out of the wound and greatly facilitates ligating the vessels and removal of the glands.

Fig. 77. Showing anastomotic circulation of the rectum and sigmoid flexure; also how the circulation is carried on through the lower sigmoidal artery after ligation of the superior hemorrhoidal artery. A, superior hemorrhoidal artery; B, lower sigmoidal artery; C, branches above and below showing poorly nourished portion between the two arteries.

The fat and glands should be removed from the blood vessels toward the gut until the lower sigmoidal artery is discovered and traced to its origin in the superior hemorrhoidal artery. Just above the lower sigmoidal, the superior hemorrhoidal artery should be tied with two ligatures and cut be-

tween them. The lower sigmoidal artery is usually found just below the promontory of the sacrum within the angle of the iliac vessels. This procedure provides for an anastomosis at whatever portion of the gut the amputation is made. The deep fasciæ behind the lower stump of the ligated vessel is split and the fat and glands at the side of the rectum down to the sacral cavity and to the tip of the coccyx posteriorly and the upper surface of the levator ani on both sides are cleared out. This cavity is then packed with moist hot pads to control oozing if present.

To free the rectum of its anterior peritoneal coat an incision is carried across the gut one inch above the tumor extending through the cul-de-sac between the rectum and the bladder or the uterus. Then without too great traumatism the rectum is separated from the organ in front of it by blunt dissection as far down as possible. This dissection can, as a rule, be carried down to the prostate. After separating these organs the packing previously put into the sacral cavity may be removed and the effect of the ligation on the blood vessels may be observed.

The lowest portion of the gut in which the blood supply is good should be selected and carried down to the tip of the coccyx to determine whether the length is sufficient to be brought out at the normal anus, without too much tension. Should the portion of gut selected not reach the normal anal opening one should determine whether the blood vessels or meso-sigmoid hold it above. Should it be the meso-sigmoid it should be incised higher up in the manner described so as to permit its descent. If it is found that the blood vessels do not permit the free descent of the gut, the one which holds the gut up should be cut between two ligatures as far from the gut as possible without involving another vessel. Then after having loosened the gut one should wait again for a few minutes to see the effect of ligation, but should not proceed until the blood supply is restored and sufficient gut loosened to permit its reaching the normal anal outlet without undue tension.

The extirpation of the mass through the perineal route

is then commenced and must be varied according to the height and size of the tumor.

The technique may be varied as follows: *If the tumor be three inches or more from the anus and of moderate size* a long narrow tape is tied around the gut above the tumor after the technique of Mounsell. The sphincters are stretched by an assistant who introduces a long dressing forceps into the rectum until the operator can feel the forceps just below the tumor. The parts are well packed off, the bowel is perforated by the forceps, the tapes are caught and, by steady traction on them, with pressure from above, the mass is invaginated through the anal opening until the sigmoid is brought down the desired extent. The operator is then enabled to free the adhesions below the mass if necessary. Having accomplished the removal of the mass, the peritoneal folds which were peeled off from the side of the gut in the beginning of the operation are now sutured back on both sides and in front, restoring the pelvic floor and the meso-sigmoid. The abdominal wound is now closed and the patient is placed in the lithotomy position in order to proceed with the perineal extirpation, as follows:

The surrounding tube or rectum is incised through all its thickness and caught with T-forceps, which exposes the invaginated sigmoid and its blood supply can be noted. The lowest segment of the sigmoid in which the circulation is proven to be perfectly good is sutured to the muscular wall of the everted rectum. The portion of the protruding gut below these sutures is then cut off and its mucous membrane sewed to that of the anal opening which is held by the T-forceps. A rubber tube is passed above the line of sutures into the sigmoid and the mass prevented from retracting by four sutures passed through the margin of the gut and outside skin of the anus. These sutures are left in for three or four days so as to permit union of the parts and then retraction of the gut is allowed. To permit drainage an incision is made into the hollow of the sacrum from alongside the coccyx and a rubber or cigarette drain is inserted.

Furthermore, Tuttle varies the technique from the above, dealing with the average or medium case, to the treatment of a growth that is located very high, or *when the growth is too large* to be invaginated through the anal opening after it has been freed from the surrounding tissue. An assistant should make an incision from the side of the coccyx into the hollow of the sacrum, permitting the tapes to be caught and the sigmoid and mass dragged out through this opening, as suggested by the Mounsell method. The peritoneal floor and abdominal incision are then closed in the manner previously described and the sacral incision is enlarged, if necessary, to permit the tumor to be drawn out, excised, and the proximal and distal ends of the gut united by circular sutures, or, in the manner practiced by Hochenegg, known as the " pull through " method, which consists of a denudation of the mucous membrane within the anal canal and drawing down or invaginating the proximal end of the bowel through the canal down to the anus, where it is united by circular sutures to the skin. This method of Hochenegg is recommended by the best authorities as a routine treatment when feasible, in order to preserve the sphincter muscles and also to avoid the formation of a fistulous tract from the point where the sutures are introduced to make an end-to-end anastomosis.

When the tumor is low down and less than two inches from the anal opening the perineal operation is advocated. But if it be found that there is too great tension on the superior hemorrhoidal arteries, interfering with a good circulation, the field of operation should be packed with gauze and the abdomen opened to relieve the tension by freeing the sigmoid and blood vessels in the manner described above. An assistant should then pull the gut down the required extent. After this is done and the distance measured, one can then proceed to repair the peritoneal floor of the pelvis and close the abdominal wound. The gut should then be sutured at the anal opening. This method affords one the opportunity of relieving the strain upon the superior hemorrhoidal artery by the abdominal route, as suggested by Challot. This proced-

ure may be reversed in the manner practiced by Hartmann, by going through the abdominal cavity first, freeing the blood vessels, closing the peritoneal floor and restoring the meso-sigmoid prior to pulling the gut down to the required extent from the perineal end. When the tumor is low down the perineal enucleation of the mass should be tried first as it offers the possible avoidance of opening the abdomen in many instances where the tension upon the gut does not interfere with the circulation.

Objections against the combined operation. The ex-tremely high mortality associated with the performance of the combined operation for the removal of malignant growths of the rectum is probably due to a lack of technical knowledge and dexterity in its performance, when we look at the subject from a clear honest viewpoint. The mortality is decreasing as our technique and experience improves in the thorough preparation of the patient before operation, combined with that necessary anatomical knowledge of the structures which surround the rectum and its blood supply.

Shock is probably one of the most frequent causes of death within the first few days after this operation, resulting prob-ably from the prolonged anesthesia and the traumatism to the abdominal viscera. Some surgeons advocate as a preliminary measure to offset sepsis, the establishment of an artificial anus in all cases, whether the perineal method alone is the choice, or the combined abdominal-perineal operation is to be performed.

An artificial anus does not permit more radical surgery or add to the safety of the patient only when the growth has as-sumed the proportions of a stricture, causing partial or com-plete obstruction. When obstruction exists to such a degree that the patient suffers from a chronic or prolonged debilitating auto-intoxication, it is our duty to relieve the condition some weeks prior to the operation, so as to allow him to recuperate sufficiently to withstand the intended operative procedure. The absorption of the retained intestinal contents and the septic material at the site of the broken-down cancerous tissue is the cause of much of the patient's suffering. When a

colostomy is done and a temporary artificial anus established we are put to the necessity of again operating upon the patient to close it, though this may be postponed until conditions are auspicious for its performance.

The exact amount of gut which can be measured to reach the anal opening by the abdominal method is in itself one of the strongest points in favor of this procedure, as when operating by the perineal route upon a growth high up one can never tell the exact degree of tension put upon the blood vessels at the time of operation and cause later destruction of the gut by a circulatory failure.

The danger of septic infection of the peritoneal cavity should not be greater than when performing any of our abdominal operations for the removal of the ovaries, uterus or the appendix, if the technique is carried out in the manner described,— restoring the peritoneal floor, suturing the reflected mesentery in its place, and closing the abdominal wound before proceeding further with the perineal enucleation.

Inferior Proctotomy is performed when the growth is located in the lower three inches of the rectum and when the gut can be pulled down without overstretching the mesentery or blood vessels, which would interfere with the circulation and cause retraction of the rectum after fixation to the anal margin.

The operation is known as Lisfranc's, or the *perineal excision of the rectum*, and is modified by different surgeons to meet the circumstances prompted by their own ideas. The technique is as follows: The patient is prepared and placed in the lithotomy position with the limbs well flexed upon the abdomen and held in position with leg holders so that the buttocks extend well over the end of the table. A catheter or sound is introduced into the bladder as a guide against injuring the urethra. The sphincters are stretched with the thumb or the dilator, and to prevent inadvertent injury of the rectum itself during its enucleation from the surrounding tissues and organs it is a wise plan to lightly pack it with gauze so that one can easily recognize it during the entire operative pro-

cedure. A circular incision is made superficially to the external sphincter, deep enough to permit grasping the rectal

Fig. 78. Skin incision for perineal proctectomy. Allingham's method.

mucous membrane with T-shaped forceps, which are held by an assistant.

The asepsis of this operation may be greatly improved at

this step by tying off the freed end immediately after suf-
ficient of the rectum is enucleated to permit doing so. The
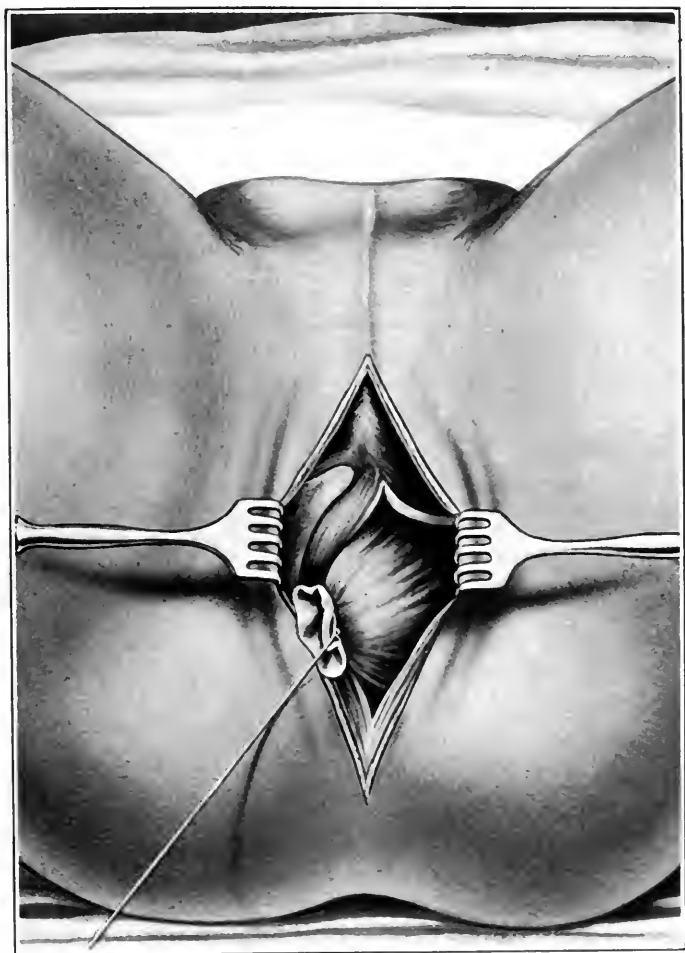
Fig. 79. Perineal extirpation of the rectum. Quenu's method.

freed end should be then cauterized with the Paquelin cautery
and all the instruments used and the hands again sterilized.

In order to facilitate operative procedure, an incision is made

without injury to the rectal mucous membrane, through both sphincters as far back as the coccyx. The enucleation of the
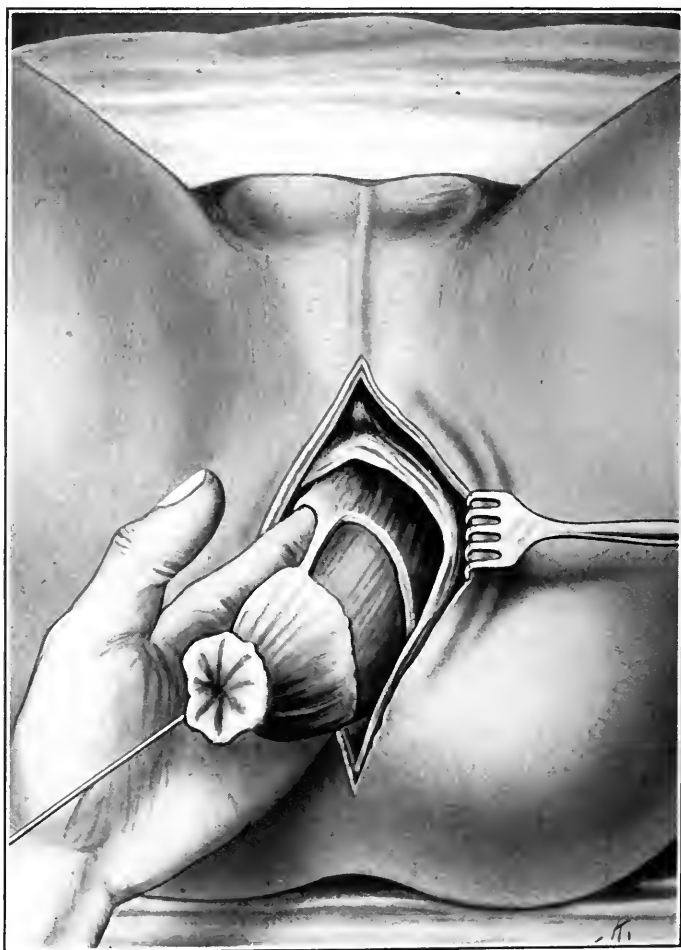
Fig. 80. Perineal extirpation. Freeing rectum from anterior attachments.

rectum is now commenced. The T-shaped forceps may be swung from right to left in order to permit access to the attachments to the surrounding tissue and the dissection is car-

ried on with the fingers, the knife or the blunt scissors, as
necessity demands. The use of the sharp-pointed scissors or

Fig. 81. Completed perineal extirpation of the rectum.

the knife is to be condemned during this process of enuclea-
tion. Only when deemed absolutely necessary should a sharp
pointed instrument be used, as the danger of button-holing the

bowel, the urethra, or the vagina is very great. The enucleaton will be found to be very much easier posteriorly than anteriorly on account of the anterior portion being so closely attached to the bladder, urethra, prostate gland or the vagina.

When the enucleation has progressed so far as to allow the growth to be free from its attachments and sufficient of the gut loosened above it to permit it to be drawn down to make the new rectum, the bowel should be amputated an inch above the growth. It is then united to the skin by interrupted catgut or silk sutures passed through the entire thickness of the rectal wall. The ends of the divided sphincters and the levator ani muscles are approximated by buried catgut sutures and a gauze drain is inserted at the coccygeal end of the posterior wound. The remainder of the wound is then closed by a continuous suture.

Primary union seldom results, owing to the tension on the gut and blood vessels. In some instances, especially when the growth is large, it is impossible to bring the end of the rectum down far enough to attach it to the anal margin and the wound is permitted to heal by granulations. This misfortune seldom happens with the more scientific and safer methods advised by the advocates of the combined operation, as the measurements are most exact and a control of the field of operation almost perfect.

Colo-rectostomy or the invagination of the colon through a slit in the anterior wall of the rectum. This operation was originated by Kelley, of Baltimore, to avoid making an artificial anus, and consists simply of the implantation of the end of the colon or sigmoid flexure into the rectum. It is the operation of choice when the growth is situated in the upper rectum or sigmoid.

The technique is as follows: The patient is placed in the Trendelenburg position and an abdominal incision about four inches in length is made over the left linea-alba and the peritoneal cavity opened. The small intestine and omentum are forced inward toward the diaphragm by laparotomy. The growth should then be exposed, but cutting the meso-sigmoid

about one-half inch from its attachment to the gut, down to a point where the gut appears to be healthy. A ligature should be tied above and below the growth. The tumor is then drawn out of the wound, removed and excised. The ends of the gut should be cauterized after protecting the surrounding tissue, with gauze, from being soiled. After having been cauterized, the edges of the lower segment should be invaginated

Fig. 82. Colorectostomy. Invagination of colon through anterior wall of the rectum.

and closed by Lembert's sutures. Four long traction ligatures are introduced at equal distances in the circumference of the upper bowel segment and the entire end again cauterized with carbolic acid to guard against infection.

An incision one and one-half inches long is then made in the anterior wall of the rectum. A long forceps is introduced into the rectum and through the incision, then, the traction lig-

atures of the upper segment are drawn upon until the upper
segment is pulled through the incision. The traction ligatures
are then pulled down to the anal opening and fastened there
by adhesive plaster or wrapped around the artery clamp so
as to hold the invaginated upper segment in its proper position
after the rectal incision. A gauze drain should be introduced
in the abdominal wound which should be closed, leav-

Fig. 83. Colorectostomy. Method of widening the lumen of gut by pressure necrosis.

ing room for a drain to the point of invagination. The
wound of the rectum heals by granulation. The patient should
be kept free from vomiting if possible.

In instances where the lumen of the bowel is found to be
too narrow after this operation, the principle advocated by
Bacon for stricture of the rectum is a most ingenuous method
of widening the bowel as illustrated in the cases reported by
Tuttle.

Vaginal Proctectomy. Extirpation of cancerous growths of the rectum through the vagina is sometimes resorted to as offering an easier method when the cancer is within three or
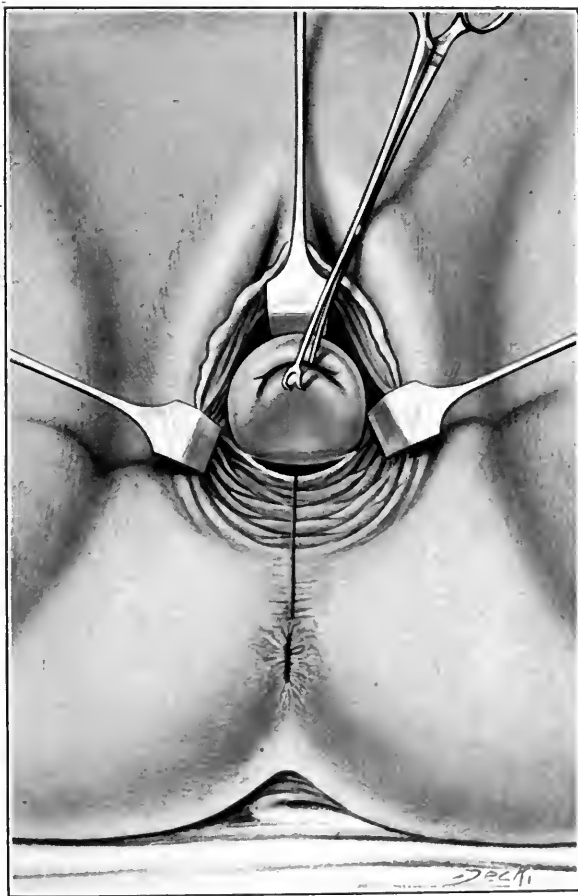
Fig. 84. Vaginal extirpation of rectum. Incisions of vagina and rectum.

four inches of the anal opening. The operation was first described by Desquin, but has undergone many changes to meet circumstances and modern ideas of different surgeons. The

technique is revised and most successfully worked out by Murphy, of Chicago, in which he goes so far as to remove the growth as high up as the sigmoid flexure.   The technique
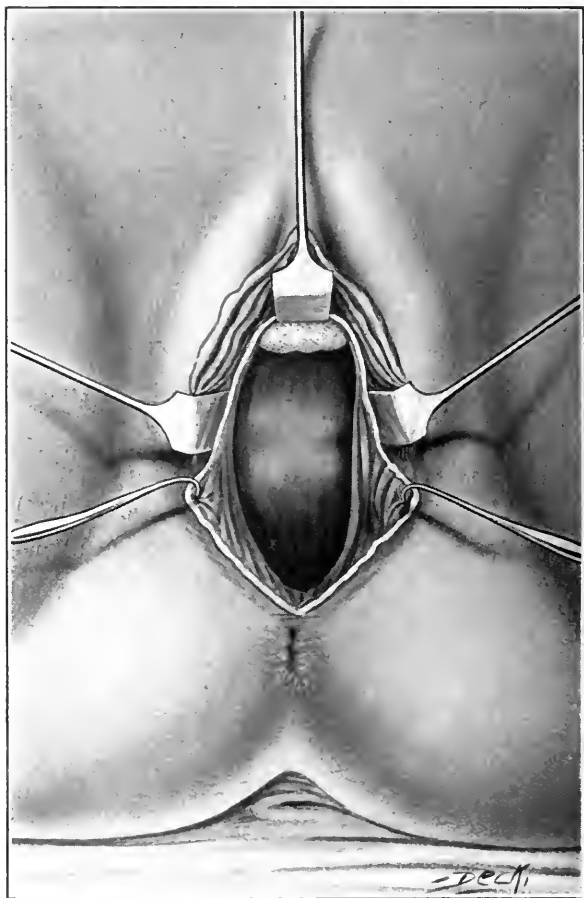
Fig. 85.   Vaginal   extirpation   of   rectum.   Rectum   cut   open
below neoplasm.

of the operation as worked out by him is as follows :   The patient is placed with the hips slightly raised in the lithotomy position, the cervix is drawn down, the vagina dilated with

broad retractors and the pouch of Douglas opened by a trans-
verse incision just below the cervix, posteriorly. The peri-
toneal cavity is packed with large laparotomy sponges so as to
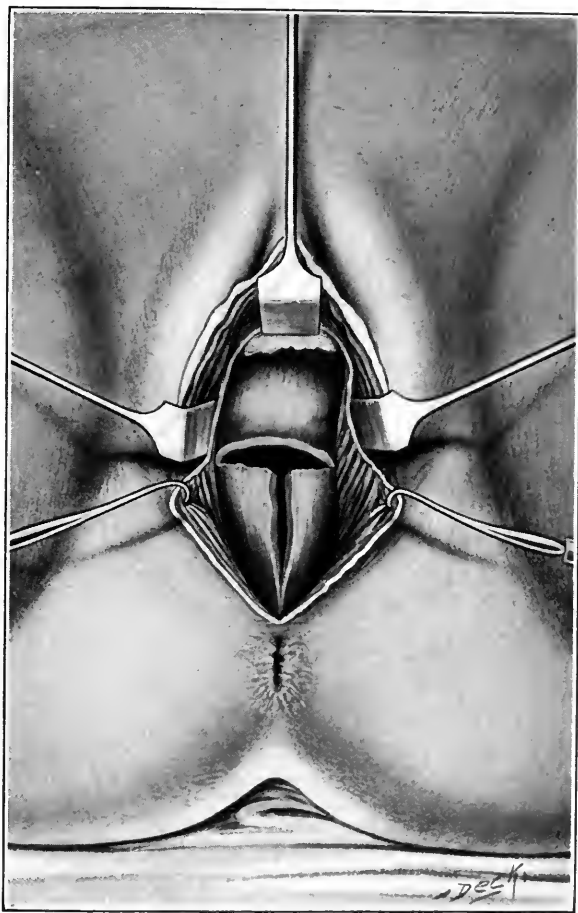
Fig. 86. Vaginal extirpation of rectum. Separation of rectum
from vagina.

keep the intestine pushed up out of the way. The rectum and
the vaginal wall is then divided by a medium vertical incision
from the transverse incision down to the margin of the anal

opening includng the sphincters. The wall of the vagina is then dissected from its attachment to the rectum, exposing the rectum to full view and examination. The anterior wall of
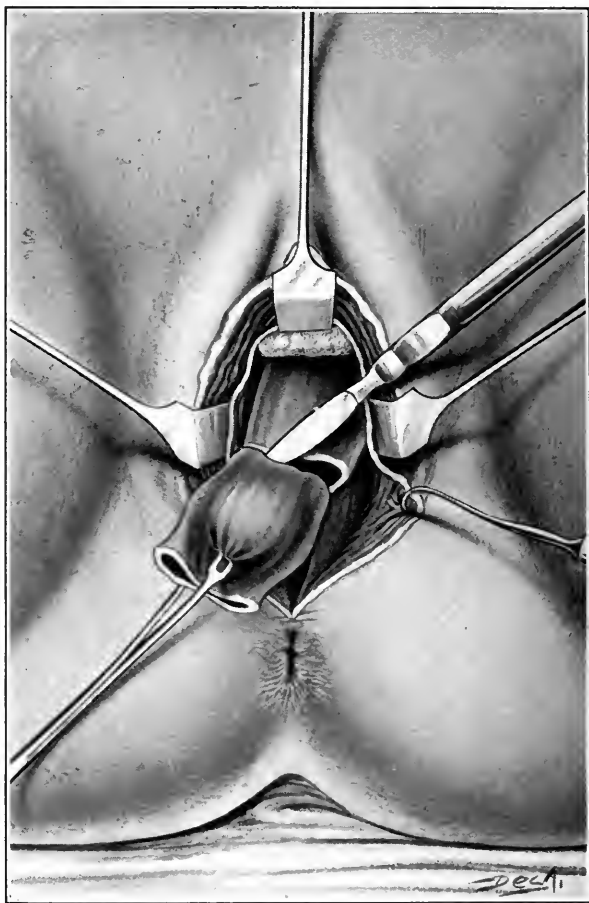
Fig. 87. Vaginal extirpation of rectum. Excision of diseased area.

the rectum is then divided from the anal opening up to within one inch of the tumor. At this point a transverse incision is made through the entire gut, including the retro-rectal tis-

sue. The upper segment of the gut is then closed with for-
ceps and its posterior attachments are separated as far up as
the promontory of the sacrum or so far as will permit the
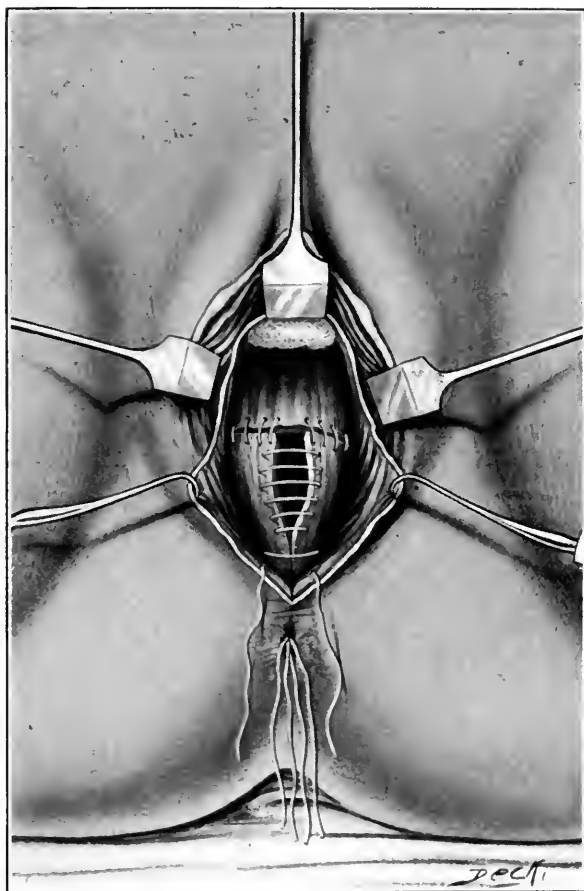
Fig. 88. Vaginal extirpation of rectum. Suturing of rectum.

growth to be drawn down, to get sufficient healthy tissue for
union with the lower segment. The growth is then ampu-
tated and the upper and lower segment are united, end to end,
by silk sutures, which should be passed from without inward,

the knots tied upon the inside and the ligature left long enough
to permit their easy removal. The anterior rectal incision
should be closed in the same way, the sutures passed from
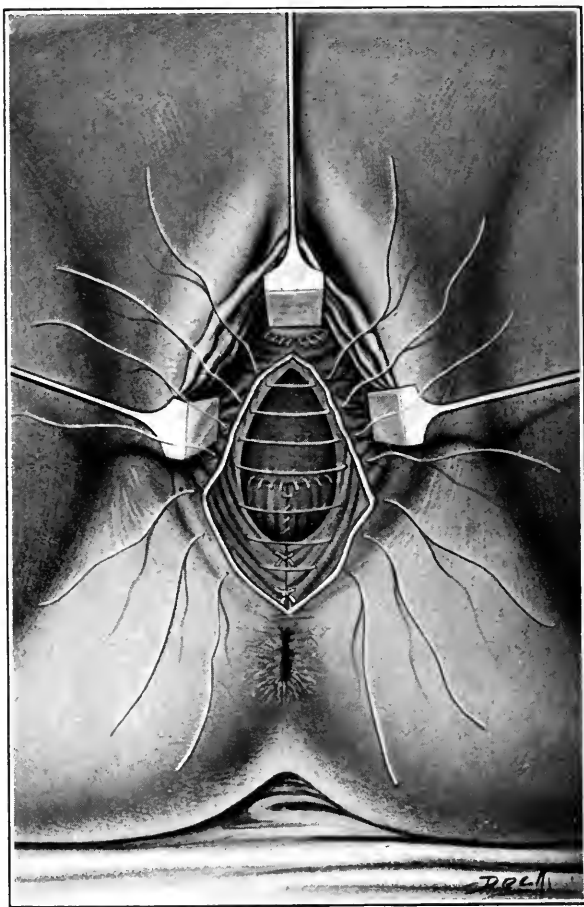
Fig. 89. Vaginal extirpation of rectum. Closure of vagina and
peritoneal cavity.

without inward and the ligatures left long. The sphincters
should be brought together by buried catgut sutures introduced
in the same manner. The peritoneal incision should be closed

with continuous catgut sutures and the vaginal wound united with silk catgut sutures. A rubber drainage tube should be introduced through the rectum above the point of anastomosis and sutured into position. The external parts and the vaginal wound should be dressed with dry sterile gauze.

Tuttle varies the technique of Murphy by commencing the operation with a muscular incision between the anus and coccyx, extending it into the retro-rectal space with the idea of permitting adequate drainage should infection occur at the point of anastomosis, or in the pouch of Douglas. After this incision has been made, the sacral cavity is packed with iodoform gauze to control oozing. The vaginal portion of the operation as conducted by Murphy is then completed excepting the gut is not cut across until it has been freed from all its attachments and the peritoneal cavity closed by sutures or firm packing.

Too much emphasis cannot be laid upon this suggestion for closing the peritoneal cavity at the earliest possible moment, as surgical work in this region is attended with danger of infection from the *communis coli* bacilli and other germs. It is probable that the mortality of the operation will always be high until our technique is so perfect as to offset infection of the peritoneum by introducing the finger into the peritoneal cavity at this point, or by the mere presence of the bacteria in the wound. The most careful and skillful operative technique during the other portion of the operation is lost and death may follow unless the strictest asepsis in manipulating the peritoneum at this point is observed.

CAUSES OF BLEEDING FROM THE RECTUM

RECTAL bleeding is so commonly associated with hemorrhoids that one is apt to be careless and fail to make either an ocular or digital examination to verify the diagnosis. Too often, the diagnosis of hemorrhoids, as given by the patient, is accepted as sufficient. Bleeding from the rectum is often the only symptom which prompts the patient to consult the physician.

Bleeding may be found in the stool when associated with severe catarrhal diseases of the colon or rectum, internal hemorrhoids, polypi, ulcer of the rectum, fissure in ano, dysentery, prolapse, malignant and non-malignant growths and erosion of the mucous membrane due to stricture or impacted feces. In addition to these causes, bleeding may be present as a complication of such constitutional diseases as typhoid fever, malaria, yellow fever, and with some cases of anemia, purpura, scorbutus, kidney and heart diseases where changes in the blood occur.

It is hard to understand why the average practitioner will permit his learning and judgment to be superseded by the opinion of the layman who makes the diagnosis of hemorrhoids, and simply asks for treatment.

The Diagnosis of bleeding from the stomach or small intestine may be made from the fact that coagulated blood from the upper portion of the alimentary canal would be incorporated with the digestive residue, while blood from the lower portion is often evacuated independent of the fecal mass in the form of a slight or severe hemorrhage.

Internal Hemorrhoids, when eroded, are the most frequent source of bleeding and probably the one cause responsible

for most of the mistakes in diagnosis. Fissure in ano and ulcer are the next frequent and a quite common cause of bleeding, but permit me to emphasize the fact that their presence do not conclusively exclude the possibility of the coexistence of rectal cancer.

Adenomata of the Sigmoid and Rectum are more frequent than is suspected on account of giving the symptoms of a protracted diarrhea. This disease in the early stages gives the ordinary symptoms of rectal bleeding, but later presents a picture of sepsis (*septicemia*), simulating that of cancer long before a malignant degeneration has occurred. These growths, when extensive, irritate the intestinal canal so greatly that a constant discharge of blood, fecal matter and broken-down tissue takes place. These non-malignant growths are too often allowed to progress to malignancy.

Cancer is found more frequently in the rectum than in any other portion of the small or large intestine and when we consider the advantages of early operation, it seems that more care should be exercised to recognize this one malady before involvement of the surrounding tissue and organs has taken place. Early operation is most promising either in an attempt at radical cure or the prolongation of the patient's life.

These patients present vague symptoms at first. As a rule, the patient complains of fullness in the pelvis, due to pressure according to the location of the growth. The pain in the early stages is very little excepting at the margin of the anus. When the growth is situated high up, the fullness of the rectum is complained of more than any other symptom, and there is a constant desire to expel the mass. Stricture, hemorrhoids, fissure or pruritis ani may be present at the same time. As a result of the ulceration and inflammation, blood is quite early in its manifestation.

A number of persons who present themselves for treatment with a history of bleeding from the rectum after stools deserve special attention. After the most careful examination no pathological lesion may be revealed either in the form of cancer, hemorrhoids, fissure, ulceration or hypertrophy of

the sphincters. Examination of the blood, kidneys, heart and liver will not elicit any systemic or primary cause of diseased condition. In fact, nothing that will account for the presence of blood will be found. Therefore, in the absence of an etiological factor to assist in the diagnosis, I have considered the bleeding of hemophilic origin, the result of the ordinary pressure exerted by the normal sphincter muscles in contraction upon the mucous membrane. My only treatment has been dilatation of the sphincters, either with or without a general anesthetic. This form of treatment seems to be of benefit for a variable period.

CHAPTER XXIII

VENEREAL DISEASES OF ANUS AND RECTUM

VENEREAL diseases of the rectum and anus are infrequent in this country. They are observed most often as a complication or secondary to infection at some other portion of the body. However, this statement does not mean that gonorrhea, chancres and chancroids have not been frequently observed primarily in the ano-rectal region.

Gonorrheal Proctitis occurs as a primary infection, but is more often observed secondary to a vaginal infection.

The Symptoms are those of an acute inflammation of the rectum. The sensation of heat, becoming so pronounced later as to cause actual pain and tenesmus with an almost unbearable desire to defecate, are the first symptoms of the disease. There is also a dull aching pain over the sacrum and later constitutional disturbances, which begin with fever, rapid pulse and general weakness. The stools may contain blood and pus. The pus at first, is of the ordinary type seen in cases of urethritis, but may become of a brownish, yellow or greenish color later. The mucous membrane becomes swollen, red and tense, bleeding easily when touched. The inflammation may cause ulceration, which fortunately is superficial and seldom undermines the mucous membrane.

Treatment. The anal region can easily be kept clean with some antiseptic solution, such as Thiersch's, bichloride of mercury or carbolic acid.

The recognized specific remedies for the destruction of the gonococci, such as nitrate of silver solution, 1-12500; argonin; argyrol; permanganate of potash, 1-4000, and protargol, should be used in the form of rectal irrigations each day for

a week. The double current rectal irrigator should be used so as to permit the immediate return of the solution. Care should be exercised to drain out the rectum thoroughly afterwards. Warm solutions give more comfort, but exceptionally cold may be preferred. Opium in the form of a suppository may be necessary to relieve the pain and tenesmus. Rest in bed is indicated in the majority of cases.

Chancroids are encountered in this region secondary to vaginal infection, as a rule.

Diagnosis. The period of incubation is ordinarily from two to five days. The lesion generally occurs in the form of multiple sores, varying in size from a pea to a dime, with irregular edges. These ulcers have a soft, inflamed base, which exudes a copious, purulent secretion and have a tendency to spread or undermine the skin, sometimes assuming a serpiginous or phagedenic character.

Symptoms. The lymphatics of the inguinal region become swollen and tender very early in the course of the disease, as the result of infection. The presence of chancroidal ulcers within the anal canal cause great pain, particularly during defecation. These ulcers resemble the non-specific fissure in character, but are more apt to be present in greater number and size. The secretions from the ulcers excite a pruritis. Stricture of the rectum or anal canal may result from extensive ulceration.

Treatment. Efforts to prevent further extension and the destruction of the bacterial factor by frequent mild antiseptic irrigations are of the first importance. The actual cautery, nitric acid, sulphuric acid or carbolic acid, are all of positive value for the destruction of these ulcers and the prevention of extension. The cauterization in this instance aims to leave a barrier of sterile tissue which prevents extension into the bordering tissue, in the manner recommended in the treatment of tubercular abscesses and fistulæ. After thoroughly cleaning the parts, a dry antiseptic powder, such as calomel, iodoform, aristol, orthoform, salicylic acid or boric acid, should be applied.

Chronic Chancroidal Ulcers should be stimulated with ich-thyol, balsam of Peru, or nitrate of silver.

Syphilis manifests itself in the ano-rectal region in the form of condylomata, gummatous deposits, ulcerations, mucous patches and chancres.

Chancres are encountered within the rectum or about the anal canal in the form of the characteristic single, firm, cup-like sores, having rounded indurated edges. The chancres have no tendency to undermine the surrounding skin or mu-cous membrane, unless of the mixed variety. They are some-times mistaken for an ordinary fissure or ulcer in the anal canal. These ulcers do not, however, cause the severe pain at defecation which is so pronounced with the common fissure.

The Symptoms and lesions of the different stages of syphi-lis are the same as manifested from infection at other points of the body.

Diagnosis. Condylomata of syphilitic and those of non-syphilitic origin, in some instances confuse one, particularly in unclean subjects. Syphilis within the rectal or anal canal manifests itself usually in the form of fissures, ulcers or a proliferating proctitis. These affections within the rectum are commonly associated with a very irritating discharge from the lesion, and when mercury is administered by mouth, the intestinal affection is still more irritated by the drug. Some-times when an ulcer or a proctitis exists from this cause, the bowel movements become so frequent and the tenesmus so an-noying that the condition is almost intolerable during the period of its use. Patients become weak and emaciated and some other method of administration becomes imperative. We are then forced to use inunctions or treat hypodermatic-ally, in order to give the required amount of mercury to con-trol the systemic disease. Salvarsan has not been used by me in a sufficient number of cases to recommend its use, as yet, in all subjects.

Condylomata latum (of syphilitic origin) appear at first as a slightly inflamed, small, red pimple, soon changing to a whitish, flat, nodulated mass with a mucoid excretion. They

increase very rapidly in number and tend to coalesce if not kept clean.

The treatment of syphilitic affections in this region is constitutional and local along the lines laid down by the authorities in this special work, which promises very soon to bring about most excellent results within a much shorter period than the treatment heretofore recommended.

Condylomata Acuminata are the result of moisture due to the prolonged irritation from a gonorrheal, chancroidal, or leucorrheal discharge, and appear in the form of warts, vegetation or papilloma. Either of these growths appear usually in patches attached by small pedicles. The secretions are very abundant and have an offensive odor, usually much more pronounced than condylomata of specific nature. The associated pruritis is most annoying and intractable to treatment. When the growth is extensive, the formation of ulcers and fissures cause extreme pain and annoyance.

Treatment. The condylomata acuminata require only local treatment directed to drying up the secretion and keeping the parts free from the discharge. The parts should be kept clean with some mild antiseptic wash and the surface dusted with powdered zinc, alum, tannin or calomel. Cauterization with carbolic, sulphuric or nitric acid acid may be necessary if healing is not rapid. Cauterization of the base with the Paquelin cautery is the best and most rapid method of cure. After the growth has been cut off with the scissors, the surface should be kept dry with one of the dusting powders suggested above.

CHAPTER XXIV

FOREIGN BODIES IN THE RECTUM

Foreign bodies are sometimes introduced into the rectum for the relief of constipation, by accident or for other purposes. Persons living in regions where lime-salts are abundant are very frequently sufferers from enteroliths, the result of small lime-salt incrustations.

Symptoms. Pain, tenesmus, discharge of blood and mucus, or disturbances of neighboring organs, dependent upon the size of the body contained within the rectum, the length of time retained and the character of the material. Genito-urinary symptoms are, as a rule, among the first associated with attempts at expulsion of the foreign body.

Diagnosis. The diagnosis is in some cases quite difficult until some definite information regarding the introduction of such material into the cavity is given and then verified by digital or proctoscopic examination. The symptoms indicating an irritation of the rectum will aid in clearing up the diagnosis.

Treatment. The rational treatment is the removal of the foreign body with the fingers if small, and without injury to the mucous membrane or muscular walls. If the foreign body is sharp or large and apt to produce pain or injury, a general anesthetic should be administered and the greatest care exercised to prevent further trouble.

Antiseptic irrigations should be recommended for a few days to relieve the traumatic proctitis, and if necessary in adults a suppository containing morphine or opium. When considerable edema is present as the result of sharp pieces of metal, glass or other foreign bodies, it may be necessary to cut the rectum posteriorly sufficient to allow extraction.

In some instances, when the foreign body is high up in the rectum where attempts at removal through the rectum would injure the mucous membrane and prove dangerous, extraction may be made from above by colostomy, it being safer from a surgical point of view.

CHAPTER XXV

HYSTERIA AND NEURALGIA

This condition ordinarily indicates an affection of the rectum in the form of pain or muscular contraction, the cause of which is not understood and no pathological lesions have been discovered to account for the symptoms. It is probable that, in our ignorance as to the nature of hysteria, the term is used for the simple reason that we cannot supply a better one.

Etiology. Constipation seems to be a common cause in the production of hyperesthesia of the rectum, particularly in people who live a sedentary, inactive life associated with neurotic tendencies. Sometimes, there will be well-marked hypersensitive areas about one-half to one inch in diameter which do not exhibit any visible evidence of disease.

The terminal nerve filaments are probably affected from either a mechanical, chemical or pathological disturbance. In some instances a disease of the central or peripheral nervous system seems the only explicable cause of the insane or hysterical rectum. Disease or displacement of the coccyx may originate the neuralgic pain commonly known as coccygodynia, but this is easily discerned and remedied by treatment.

Catarrhal Diseases and Reflex Irritations from neighboring organs, nervous diseases, rheumatism and gout are probably the sole causes of this condition of irritability and muscular spasm. In another class of patients, we have the condition known as the insensitive rectum, in which the normal sensibility of the rectum is deficient, permitting retention of enormous quantities of fecal matter. This latter condition, presenting an entirely different symptomatology from the for-

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mer, is classified under the same list of diseases not clearly understood.

Treatment. The treatment of these conditions will be dependent upon the possibility of discovering the true origin of the trouble. Where there is an hypertrophy of the sphincter muscles and no fissure or other discoverable cause can be made out, irrigations with krameria or other soothing remedies will prove of much comfort. Dilatation or incision of the sphincter will put the muscle at rest. Ulceration or any abrasions of the mucous membrane should be treated with nitrate of silver or ichthyol as is indicated. Cauterization with the Paquelin cautery in one instance exaggerated the pain and muscular spasm. Irrigation of the rectum with alternating hot and cold water will be found of great benefit in some cases. Diseases of the neighboring organs, such as retroversion, prolapse of the uterus and ovaries, should also receive treatment. Tonics directed to the improvement of the general health, combined with improved environments and habits will, as a rule, improve these patients. The administration of cocaine, opium and sedatives in general are contraindicated, as their use, either locally or internally, almost invariably produce disturbances which later aggravate the disease.

CHAPTER XXVI

INJURIES AND DISEASES OF THE COCCYX

DISEASES attributed to this bone, or at its junction with the sacrum, are so common and often referred to the rectal specialist that their consideration here can hardly be considered out of place.

The Coccyx is sometimes Congenitally Deformed as the result of an epiblastic defect during embryologic formation. It may be deviated either laterally, anteriorly or posteriorly. In cases of anterior deviation the rectum may be pressed upon by it and fecal concretions cause irritation or ulceration. Lateral and posterior deviations seldom or never give trouble, except when subjected to an injury during parturition or from an external injury.

Treatment. This condition is best relieved by removing the coccyx.

Dislocation of the Coccyx, due to a fracture, or a separation at its junction with the sacrum, the result of injury, is quite a common condition. Patients complain of pain and discomfort in sitting when the condition has involved the nerves supplying this articulation.

Treatment. The removal of the bone is recommended in these cases also. The backward or forward displacements of the bone produces almost the same symptoms as the congenital deformity and are practically the same pathological condition.

Coccygodynia is a condition which is commonly met with after parturition — the result of a rupture or the stretching of the ligaments and the fractures of the bone at that time. The pain is most persistent and definitely referred to the region of the coccyx. The condition may also be due to an ostitis,

rheumatism or to neuralgia, but is more commonly due to an injury to the bone.

Symptoms. The pain is described as a dull ache, often with a feeling of heat and soreness, producing in turn a disturbance of the nervous system. It is ordinarily increased by exercise by bending the body forward, at defecation, or by slight injury to the bone. Ulceration at the posterior margin of the rectum or scars, the result of operation in the segment of the anal ring, cause pain which resemble coccygodynia very much.

The diagnosis can ordinarily be made from the history given by the patient and examination, with the index finger in the rectum and the thumb over the coccyx. The slight manipulation of the bone increases pain so greatly that there can hardly be any mistake in the diagnosis. A tumor of the coccyx will manifest itself in the form of a swelling.

The treatment ordinarily extends over many months or years, as these patients are loath to seek medical advice. Rest, with painting the affected part with iodine, will in mild cases prove of benefit. The bowels should be kept open so as to avoid injury from hard fecal masses. The application of the actual cautery has in some cases proven quite a success. At a dull heat it is brushed over the parts. After palliative treatment has failed to give relief, the surgical methods of total excision, or tenotomy should be advocated.

Tenotomy. Tenotomy is performed as follows: With a tenotomy knife, an incision through the skin is made near the tip of the coccyx, and then carried upward over the back surface of the bone, which is then freed from all its attachments to the surrounding parts. The knife is then turned at an acute angle and the lateral attachments severed on both sides. The incision is then extended beyond the tip of the bone on both sides, freeing it from all its attachments excepting at its base or junction with the sacrum. In this manner, the bone is freed from all its muscular attachments and rest secured. This form of treatment is applicable to cases in which the bone

is free from disease, but will not relieve malformations or fractures.

Total Excision is preferable in the majority of cases, affording a greater degree of success and making the field of operation technically more perfect. The blood vessels which may be severed during tenotomy are easily controlled during this procedure without undue traumatism to the surrounding tissue; and the muscles which are divided are not left to inflame the sacro-coccygeal joint afterwards. The operation as recommended by Gant is deserving of description for its simplicity and the short period of time consumed during its performance. The operation is practically bloodless and the special requisites for its performance are a pair of strong, blunt scissors, specially designed by Gant, a large curved needle and two or three catgut sutures.

The technique of the operation is as follows: The skin and deeper tissue over the end of the coccyx are grasped with the thumb and finger, making a fold at right angle to the coccyx. These structures are cut through down to the bone with one stroke of the scissors, making an incision one inch long, parallel with the coccyx. The coccyx is then freed and the end lifted upward with the left index finger. The ligaments and muscles are then cut away from both sides and the end, at the same time keeping the scissors pointed outward. While the position of the fingers are unchanged, the scissors should be placed at right angles to the coccyx, and the bone disarticulated. The wound should be closed with two or three interrupted sutures and dressed with sterile gauze which is held in place by adhesive plasters.

Coccygeal Tumors and Cysts. Luschka's gland or the coccygeal body may be the seat of inflammation and undergo degeneration in the form of cysts or abscesses. Neoplasms are less frequent than tumors which originate as the result of a congenital deformity. Dermoid cysts are probably the commonest form of tumors found in this region. Tumors are found in the adult which upon examination reveal a congenital

origin not clearly understood. Supernumerary fingers, toes, and other portions of the body have been discovered in growths which originated in the sacro-coccygeal region. Spina bifida are situated as a rule directly in the medium line and should warrant careful investigation to make a certain diagnosis. When opened the fluid of these spinal tumors shows the presence of sugar which points to the involvement of the spinal canal.

The diagnosis of these growths is as a rule easy because of their location and size.

The treatment consists of tapping, ligation with partial resection, and complete extirpation.

Tapping in the majority of cases is an extremely dangerous proceeding particularly when these tumors are connected with the spinal cord in the form of a spina bifida, and the process is followed, as a rule, by convulsions, meningitis, and sometimes death.

Partial resection and ligation is only resorted to when extirpation is not attempted on account of the extension of the growth into the deeper tissue. In these cases the tumor should be ligated and as much removed as possible after the ligature has been placed about the mass to control bleeding.

Ligation. When the tumor is small and pedunculated it may be ligated with the idea of having it slough off. This method of treatment is not indicated when the tumor is very large or when the ligature cannot be applied high enough to include all of the sac. Sometimes the ligature fails to cut through all of the pedicle and will leave the tumor only partially severed from its attachments.

Complete Extirpation. This method of treatment is followed by the best results, with the exception of those tumors of spinal origin which are best left alone. The operative technique for the removal of these tumors is as follows: An incision is made over the tumor and it is dissected out with the fingers or blunt scissors. The pedicle of a cystic tumor should be traced to its attachments to the sacrum so as to make com-

plete extirpation certain. The greatest care should be exercised against puncturing these cystic tumors. When they are found invading the pelvis and involve the peritoneum, the latter should be closed with catgut sutures before closure of the external incision. Necrosed bone should be curetted so as to permit healthy granulations. Supernumerary limbs found within or attached to these tumors should be amputated or resected as demanded by circumstances.

CHAPTER XXVII

FECAL INCONTINENCE

FECAL INCONTINENCE may manifest itself in the partial or complete forms, the result of disease in the lower rectum, or the destruction of the contractile power of the sphincter muscles from surgical operations. Operations for fistulæ most frequently cause incontinence. Incontinence is most likely to occur when the internal sphincter is cut and when both muscles have been cut in several places obliquely. The condition also follows operations for cancer, hemorrhoids, stricture, fissure, ulceration, and prolapse when parts of the muscles are incised, removed, or that an extremely large scar has formed as the result of slow granulations.

Incontinence also occurs as the result of too rapid or extreme divulsion of the sphincters, injury or disease of the spinal cord, laceration of the sphincter during labor, and from procidentia, ulceration and stricture of the rectum.

Symptoms. The manifestation of fecal incontinence is the escape of gas and fecal matter which may be partially or completely beyond the control of the sufferer. The condition may be dependent upon the liquid, solid, or gaseous discharge. Patients who are constipated happily do not suffer so greatly as those with liquid movements. Temporary incontinence may supervene the incision for superficial fistulæ and relief come when the tract is healthily healed.

The non-operative treatment simply confines us to an effort to render the stool firm or of a semi-solid consistence to prevent frequent discharges. The diet should be regulated to foods which constipate. Opiates and astringent medicines may be administered when absolutely necessary, but opiates with care and judgment as to liability to habit formation.

The Surgical Treatments suggested for the relief or cure of incontinence are cauterization and plastic operation.

Cauterization is employed in the majority of cases and is attended with good results. The Paquelin cautery is heated to a dull red and pressed into the mucous membrane and the sphincter muscles above, and brought out at the muco-cutaneous junction. The procedure should be repeated in a manner similar to the linear cauterization for prolapse of the rectum at several points. The after-treatment is the same as in that operation, efforts being made to prevent adhesion by vaseline-smeared strips of gauze, which are to be kept in the rectum for a week after operation. The operation to attain permanent success may be necessarily repeated at intervals of several months. Some surgeons simply cauterize at the point of separation of the sphincters with the idea of forming a firm, hard scar. The operative treatment often involves the repair of the vaginal wall in woman and therefore necessitate any of the common operations for a lacerated perineum or relaxed vaginal outlet. The operative procedure recommended in such cases is as follows:

The vaginal and lower portion of the rectum is thoroughly cleansed and a V-shaped area is denuded which represents the torn wall of the rectum. The apex of the V should be up in the rectum between the torn fibers of the internal sphincter, and the two arms of the V rest upon the torn ends of the divided external sphincter muscles. The denuded surface should be slightly wider at these two points of the divided ends of the external sphincter. The torn ends of both sphincters should be dissected out and identified before attempting to bring the parts together. Sutures

Fig 90. Repair of sphincters. Sutures in torn rectum, which protrude from the anus when completed.

of silk or chromic gut are introduced in the manner represented in Fig. 90, with the ends in the rectum where they

should be tied. The ends of the sutures are left long, protruding from the rectum. Repair of the vagina when necessary should be made secondary to this operation.

Gersing's twisting of the rectum and Chetwood's utilization of a portion of the glutei muscles for a sphincter are not generally performed for the relief of incontinence on account of the scarcity of statistics supporting their value.

Left inguinal colostomy is advocated by some surgeons when local operations have proved futile and when the case is complicated by the severe annoyance of chronic diarrhea.

CHAPTER XXVIII

RELATION OF GYNECOLOGY TO RECTAL DISEASES

THE rectum and the genito-urinary organs are so closely grouped together in the pelvic cavity; the nerves, blood vessels, and lymphatics so intimately associated that it seems only reasonable to expect disease in one would be very likely to disturb the other, functionally or sympathetically. Indeed, this anatomical relation is even more strongly brought to our attention when we consider their common origin from the meso-blast. The reproductive organs of the female are particularly prone to reflex disturbances due to rectal pain.

In old men a prostatic atrophy or hypertrophy is very commonly associated with a rectal disease over the prostate analagous in its pathology. The anatomical and physiological association of the bladder and rectum is most complex in both sexes as a disturbed physiological activity is easily ascribed to either organ. This is again confusing on account of diseases in either being of frequent occurrence.

So, too, the symptoms of diseases located in the reproductive organs of the female, when occurring on the left side, cannot be made out clearly enough in some cases by our modern means of diagnosis. Without great care in examination one is very apt to overlook the disease in the intestine and ascribe the tender point over the ovary to an inflammation of that organ, when in reality the real source of trouble is due to an impacted sigmoid. An angulation of the sigmoid may be caused by adhesions to the stump of an extirpated ovary, which may, long after the operation, cause the patient to complain of pain and suffering, almost identical in character and in the same location as the original trouble.

There also seems to be a nervous impression, if one may use the term, of one with the other, as a traumatism to one or an inflammation of the other is very likely to have its effect upon both. This may be due to the close anatomical relation in the spinal cord of the nerve centers governing these organs which allow seemingly a short circuit of efferent and afferent impulses.

These phenomena are often illustrated by the retention of urine after hemorrhoid operation, and from the other side of the tract, congestion due to dysmenorrhea and prolapsed ovaries; or with the presence of a parametrial inflammation the subject also suffers from proctitis, spasmodic anal sphincters and cystitis.

Irritation of the rectum may have a reflex action upon the female pelvic organs owing to the close relationship or proximity of their nerve centers. An ulceration of the rectum may cause irregularities of the menstrual flow; or amenorrhea, in cases of periodic bleeding from the rectum.

An encroachment from growths of the female pelvic organs upon the rectum, as a rule, does not occur unless the cavity is snugly filled up, or the growth is wedged in the pelvic cavity so as to be unable to rise above the pelvic brim. Large tumors rise above the brim in the same manner as the pregnant uterus and seldom cause constipation. Ovarian cysts, pelvic hematocele, hæmatoma and large inflammatory exudates into the broad ligaments, often cause some degree of constipation. Stricture due to malignant growths in the uterus or its appendages, involving the surrounding tissue, or secondary deposits in the pouch of Douglas, almost invariably cause constipation and inflammation of the sigmoid or rectum.

The peri-rectal tissue is often involved in female pelvic inflammations or abscesses and it has been my experience to see a case in which three strictures of the rectum resulted from such an inflammation which extended to the rectal walls. Appendicular abscesses sometimes rupture into the sigmoid flexure, particularly those formed post-operative. Abscesses which rupture into the rectum usually have very small open-

ings and tend to repeated retention and discharge of pus, which is always a menace to the life of the patient from re-infection. An enema has been known to enter an abscess which opened into the rectum and caused infection of the peritoneum by bursting through the abscess wall.

Abscesses in the lower abdomen are limited by the juxta-position and adhesions formed by the small gut, omentum, sigmoid flexure or the rectum. A pelvi-rectal or retro-rectal abscess commonly originates from the female pelvic organs. Statistics reveal the history of the rupture of a tubal gestation through the bowel with the discharge of blood and feces, and in another instance, records the rupture and discharge of an ovarian cyst into the gut. Generally a retro-uterine abscess is associated with painful defecation which is referred high up in the rectum. These patients continue to suffer for a long while after the subsidence and absorption of the abscess cavity as a result of the scar. Scars which follow inflamma-tion of the cervix, the parametrum, or tears in the cervix, are said to be common causes of constipation.

Viewing the subject of *reflex neuralgic pains,* due to ovarian or cervical disease, from the standpoint of the gynecologist, we have many truthful instances of relief from suffering in distant parts of the body by removal of the diseased ovary or repair of the cervix. Sometimes the secondary disturbance to disease of the genito-urinary organs produces even a greater reflex agitation than the primary trouble, as a dysuria, dysmen-orrhea or vaginismus due to a rectal ulcer, fissure, proctitis, or constipation with auto-intoxication. Almost invariably an ulcer of the rectum, stricture, fissure or inflammation of the crypts of Morgagni, when of long duration, will inflict suf-ficient irritation to the nervous system to cause either a local neuralgia or other symptoms of nerve impairment. These cases sometimes give a well-marked symptomatology of ovar-ian or uterine pain and after douches and tamponing in the treatment given by the gynecologist, are relieved of these symptoms by the cure of some rectal disease. These mistakes arise from the description of the pain as given by the patient

being accepted as sufficient for a correct diagnosis. An ulcer of the rectum, fissure in ano, anal stricture or a cryptitis will often not only cause widespread reflexes but cause local reflex spasm of the levator ani and sphincter vaginæ muscles, which, while in a state of spasm, constricts the parts.

The anal mucous membrane or muscular apparatus are often irritated and kept in a condition of pain, by cystitis, vulvovaginitis, displacements and adhesions of the uterus or ovaries. Stricture in the peri-rectal tissue from old inflammations around the uterus often cause pain which is referred to the rectum, when the primary and pathological origin lie in the parametrium.

Reflex pain, which is described by the patient as shooting down the legs, is common to diseases which are located in the rectum, anal ring or pelvic organs and must not be accepted as being worthy of much diagnostic significance in the differentiation of these diseases. Pressure from a tumor of the uterus or its appendages is quite as likely to cause pain of this character as the constant irritation from a rectal ulcer.

Pains referred to the floor of the pelvis and the sacral region are so intimately associated with disease of the rectum, anus and the female pelvic organs that very often our only means of correct diagnosis is by elimination or exploratory laparotomy. Heretofore pains in the back and within the pelvic cavity were all supposed to be due to a laceration of the cervix, weakened levatores ani, or a prolapse of the uterus. Later, the ovaries, tubes or adhesions of the different generative organs were the objective points for operation and were removed in order to relieve these symptoms. While in many instances relief is attained by such treatment it should not be taken as a fact that all sacral and pelvic pain is due to disease of these organs and for the benefit of humanity a broader scope of learning will emphasize the usefulness of proctology.

These pains may be due to rheumatism or strain of the iliosacral synchondrosis and necessitate treatment from that point of view. Therefore, a rectification of disease in the female

pelvic organs, the removal of hemorrhoids or the cure of rectal ulcer will not cure the pain in patients suffering from disease of this joint. Sometimes we meet with cases which represent a combination of these conditions, particularly after child birth, when there exists a rupture of the perineum, rectocele, hemorrhoids, a fissure in ano, a partial prolapse of the uterus and a traumatism to the ilio-sacral joints which has terminated in rheumatism. A cure of either one of these conditions is not likely to relieve the pain and suffering due to the others, so that the gynecologist, to obtain success, must broadly consider the cause and effect of pathological conditions within the pelvic cavity. The question becomes one of complete differentiation, diagnosis and the exact determination of the causes; then, the institution of radical and effective treatment to each and all of the diseased conditions in either organ.

The rectum is functionally intended as a receptacle for the fecal mass prior to expulsion; the expulsion of its contents at regular periods, and the absorption of the fluids contained in the feces. These physiological functions may easily be interfered with to a variable degree by diseases of the female organs of the pelvis or, mechanically by pressure from them. Irritation from inflammation, pressure from a retro-verted uterus, or adhesions which cause deformities in the form of angulations or stricture, either interfere with peristalsis of the lower bowel, with the normal supply of blood, or the nerves which maintain its equilibrium.

Parturition, procreation, menstruation and micturition are the functions of the female genital organs and are often altered very much by affections of the rectum as follows:

Micturition is affected by acute inflammations, fissures, painful rectal ulcerations, traumatisms, either surgical or direct violence and by large growths of the rectum.

Menstruation may be delayed by constipation or brought on by a diarrhea, and caused to act vicariously by any discharge, hemorrhage or profound shock to the nervous apparatus of the rectum in the form of a surgical operation.

Procreation may be interfered with by fecal impaction which causes an acute flexure of the uterus.

Parturition may be interfered with temporarily by a foreign body or fecal impaction of the lower rectum, hypertrophy of the levator ani muscles, which prevent a full relaxation of the perineum, and totally impeded by the presence of a large fibroid or other tumor of the rectum.

The rectum is also used for the absorption of nutrient enemata. Its wonderful osmotic power is well illustrated in the Murphy irrigation which consists of a physiological saline solution intended to assist the system in the neutralization of bacterial poisons. The Fowler position and these saline irrigations have together given us ample reason to regard the lower intestinal canal as offering a most valuable adjunct in the treatment of surgical cases complicated by pus in the lower abdomen.

Affections of the sigmoid flexure, such as perisigmoiditis, diverticulitis and sigmoiditis, are often overlooked, due to the assumption that all pain over the left inguinal or iliac region is the result of tubal or ovarian disease. The symptoms of pain or tenderness which are made worse by walking, deep pressure on abdominal examination or palpation through the vagina, invariably suggest to the gynecologist the possibility of ovarian disease, which may exist associated with an affection of the sigmoid, as an impaction of feces, hypertrophic catarrh, angulation, or any of the diseases of the sigmoid flexure mentioned above. These conditions are commonly present together, as verified by sigmoidal examinations, and are often due to primary affections of the uterine appendages, but must be treated with the original cause to ensure relief. These sigmoidal affections are diagnosticated by means of the sigmoidoscope or in some cases only by opening the abdomen.

Auto-intoxication resulting from the absorption of putrid material or bacteria by the intestinal mucous membrane is more recently being regarded as a common cause of mental and nervous disorders by neurologists: and the influence of

the disorders of the intestinal tract upon the system in general is attracting rigorous study.

Rectocele is partly or wholly due to a separation of the levator ani muscles and the patient not only suffers from the ordinary vaginal symptoms due to the bulging posterior vaginal wall, but from distortion of the rectal cavity and weakened physiological action of these muscles in defecation. As a result fecal accumulation and irritation of the rectum takes place.

In conclusion we learn that to make a complete diagnosis the relation of gynecology to proctology must be understood, because the diagnosis is often based upon the differentiation of symptoms, irrespective at first as to their origin and then, by elimination, the determination of the primary cause. It points out the absolute necessity of a broad knowledge regarding the diseases of the rectum by the general practitioner.

It is lamentable to admit that the average practitioner cares little and does still less in the study and treatment of these diseases.

CHAPTER XXIX

FORMULARY

THE following formulary of prescriptions is appended for the purpose of aiding in the adoption of some definite recognized medication in the treatment of the common forms of rectal diseases. It is earnestly hoped that these variously selected combinations will not tend to embarrass the thinking practitioner. Their aid can only be temporary in the majority of cases, unless assisted by the intelligent treatment of the existing disease.

For Acute Proctitis

℞   Mucilage of starch ....℥ ij.
      Tr. opii ....x-xxx.

℞   Iodoform ....℥ i
      Ext. belladon ....gr. v.
      Pulv. opii ....gr. x.
      Ol. theobrom ....q. s.
M. Ft. Suppositories No. XII.

℞   Liq. carbonis detergent ....℥ ii.
      Tr. krameriae ....℥ iv.
      Mucil. amyli ....q. s. ad ℥ iv.
M. Liq. Inject. ℥i morning and night.

℞   Liq. bismuth ....℥ i
      Mucil. amyli ....℥ vi.

℞ 20 per cent. sol. aq. fl. ext. krameria inject one quart every second day.

℞   Sub-nit. bismuth ....℥ j.
      Iodoform ....gr. x.
      Sweet almond oil ....℥ j.
M. S. Inject.

℞ Fluid hydrastis ....ℨ j.
    Aquae ....℥ j.
M. S. Inject.

℞ Listerine ....
    Aquae ....aa ℨ j.

For Chronic Proctitis

℞ Argent. nit ....gr. v.
    Aq. dest ....ℨ ij.
To be injected and removed by a subsequent enema.

For Eczematous External Hemorrhoids. (*Ball.*)
  ℞ Liq. carbonis detergentis ....ℨ j.
     Liniment. calcis ....ℨ v.

For Inflamed External Hemorrhoids. (*Yount.*)
  ℞ Cocaine hydrochlor ....gr. v.
     Ext. belladon.
     Ext. opii.
     Ext. aconite.
     Ext. stramonii ....aa ℨ ij.
     Glycerine ....ℨ ss.
M. S. Apply on cotton or lint continuously.

For Hemorrhoids (with tenesmus).
  ℞ Pulv. opii.
     Ext. belladon ....aa gr. x.
     Ol. theobrom ....q. s.
M. Ft. Suppositories No. XV.

For Hemorrhoids

For Hemorrhoids (where it is desired to confine the bowels after operation. *Allingham*).
  ℞ Pulv. cretae aromat ....℈ j.
     Tr. opii. or liq. opii. sedativ ....m xv.
     Spts. aeth. nit ....ℨ j.
     Mist. camphorae ....ℨ iss.
M. S. To be taken night and morning for two or four days.

For Hemorrhoids (laxative). Soft non-irritating stools.

℞   Magnes. sulph.
      Magnes. carb.
      Sulphur precipitat.
      Sacch. lactis ....aa ℥ ss.
      Pulv. anisis ....℥ ij.
   M. S.   One or two teaspoonsful in water at night (Prof. G. T. Elliot).

For producing soft, non-irritating stools.

℞   Sod. bicarb ....℥ ii.
      Pulv. rhei ....℥ i.
      Glycerin ....℥ ii.
      Aquae ad ....℥ iv.
   M. ℥ i.   Before meals.

℞   Ext. colocynth coab.
      Ext. cascarae ....av. gr. xll.
      Ext. belladon ....
      Ext. nux. vom. ....av. gr. iii.
         in pil. no. xll.
   M.   One or two at bed time.

For Inflamed External Hemorrhoids.   (Tuttle.)

℞   Morph. sulphat ....gr. v-x.
      Ichthyol ....℥ iv.
      Ung. belladon ....
      Ung. stramonin ....av. ℥ i.
   M.   Apply two or three times a day.

℞   Sol. boroglyceride ....℥ iv.
                  20%
   M.   Apply with lint and apply hot water bag over it.

℞   Ext. suprarenalis ....℥ i.
      Ung. lanolin ....℥ i.
   M.   Apply on

Varicose External Hemorrhoids.

℞ Ung. acid tannice ....℥ iv.
   Ung. stramonin ....
   Ung. belladon ....ad ℥ i.
M. Apply as ointment to parts.

Hemorrhoids. Bleeding and pain. (Cathcart.)

℞ Ung. ac. tannici ....℥ ss
   Ung. stramonin ....
   Ung. belladon ....aa ℥ i.
M. Apply after reduction of hemorrhoids.

(*Allingham.*)

℞ Ext. belladon ....℥ i.
   Ext. hyoscym ....℥ ii.
   Ext. conii ....℥ ii.
   Vaseline ....℥ i.
M. Apply on piece or rub over parts.

(*Matthews.*)

℞ Mur. cocaine ....gr. xii.
   Iodoform ....℥ i.
   Ext. opii ....℥ ss.
   Vaseline ....℥ i.
M. Apply locally or through pile pipe or suppositories.

℞ Ext. hamamelis ....gr. iii-v.
   Ext. theobrom ....q. s.
   Ft. in suppos ....No. I.

(*Tuttle.*)

℞ Ichthyol and tannic acid ....
   Ext. belladon
   Ext. stramonin ....av. gr. ⅓.
   Ext. hamamelis ....gr. x.
   Ft. in suppos. No. 1 ....

(*Hamamelis.*)

℞ Pulv. opii ....gr. x.
   Ext. hyoscyn ....gr. xii.
   Ext. hamamelis ung ....℥ ii.
   Vaseline ....gr. ℥ i.

M. Use through pile pipe. Sufficient for twelve applications at four hour intervals.

℞ Ext. suprarenalis ....℥ ii.
   Ol. theobromal ....℥ v.
M. Ft. in suppos. No. XX.

(Commercial.)

℞ Sulph. morph ....gr. 1½.
   Tannin ....gr. 24.
   Pine tree tar ....
   Wax ....gr. 36.
   Benzoated lard ....gr. 383
M. Use locally.

(Tuttle.)

℞ Ichthyol   ⎫
               ⎬........................av. gr. v.
   Tannic acid ⎭
   Ext. belladon ⎫
                 ⎬....................av. gr. ⅓.
   Ext. stramonin ⎭
   Ext. hamamelis ....gr. x.
M. Ft. suppository.

Non-operative Thrombotic Hemorrhoids. (*Goodsall & Miles.*)

℞ Lig. plumb. subacetatis ....℥ ss.
   Spint. vim rectificate ....℥ i.
   Glycerin ....℥ ss.
   Ag. rosne ....℥ x.
M. Apply on lint; renew every two to four hours until absorption of clot.

(Gant.)

℞ Lig. plumbi subacetatis ....℥ iv.
   Tinc. opii ....℥ iiss.
   Ag. distillatae ....℥ iv.
M. Apply constantly ice cold on cotton or gauze.

For Hemorrhoids with ulceration. (*Allingham.*)

℞ Bismuth sub-nit ....℥ ij.
   Hydrarg. chlor. mit ....℈ ij.

Morph. sulph ....gr. iij.
Glycerine ....℥ ij.
Ung. petrol ....℥ j.
M. S. Use in pile syringe.

℞ Acid. tannic ....℥ ij.
Ext. belladon ....
Pulv. opii ....aa. ℥ ss.
Ung. petrol (or lanolin) ....℥ j.
M. S. Apply inside and outside.

℞ Plumbi subacet.
Bals. Peru.
Ext. belladon.
Zinci. benzoat ....aa ℥ j.
Adipis ....℥ j.

℞ Cocaine hydrochlor ....gr. x.
Ol. theobrom ....q. s.
M. Ft. Suppositories No. XV.

(Ball.)

℞ Morph. hydrochlor ....gr. x.
Ext. belladon ....
Acid. tannic ....aa. ℥ j.
Vaselin ....aa. ℥ j.

For Hypodermic Treatment of Hemorrhoids

℞ Acid. carbol (crystals) ....gr. xx ℥ ij.
Glycerine ....q. s.
Aq. dest ....q. s. ad ℥ j.

℞ Acid. carbol (crystals) ....℥ ij.-℥ iv.
Glycerine ....q. s. ad. ℥ j.

(" Brinkerhoff System.")

℞ Carbolic acid ....℥ j.
Olive oil ....℥ v.
Chloride of zinc ....grs. viij.

Advise injections as follows:

        Largest piles ....8 minims.
        Medium piles ....4 to 8 minims.
        Small piles ....2 to 3 minims.
        Club-shaped painless piles near orifice...2 minims.

" Brinkerhoff's system " forbids the injection of any but internal piles.

(" Borick System.")

R Carbolic acid.
    Glycerine ....aa ℥ ij.
    Fl. ext. ergot ....℥ j.
    Water ....℥ iss.

Mix.

(Green's painless injection.)

R Carbolic acid ....℥ j.
    Creosote ....gtt. x.
    Acid. hydrocyanic ....gtt. j.
    Olive oil ....℥ i.

Mix and unite under water. Sig. Inject enough to turn the tumor an ashen gray color.

(Dr. Silas T. Yount of Lafayette, Ind., advocated very weak injections, viz.)

R (five per cent. solution.)
    Acid carbol ....gr. xxiv.
    Aq. dest ....℥ j.

M.

R (3% solution.)
    Aq. dest .... gr. xviss.
    Aq. Dest ....℥ j.

For Fistulae

(Brinkerhoff.)

R Dist. ext. hamamelis ....fl. ℥ v.
    Liq. fer. subsulph ....fl. ℥ j.

Acid carbol. cryst ....gr. ij.
Glycerine ....fl. ʒ ij.

M. S. Inject ten or fifteen drops deeply into the fistula, and press the track of the fistula with the finger to force the fluid more deeply in.

Many itinerants finish the operation two hours later by injecting the fistula with equal parts of oil of eucalyptus and glycerine.

For Fissure in the Anus

℞ Corrosive sublimate ....gr. j.
Cryst. carbolic acid ....ℨ ij.
Hydrochlorate of morphia ? ....gr. v.
Water ....fl. ʒ iv.
M. S. Apply with a camel's hair pencil.

(Allingham.)

℞ Hyd. sub. chlor ....gr. iv.
Pulv. opii ....gr. ij.
Ext. belladon ....gr. ij.
Ung. sambuci ....ʒ j.
M. Sig. Apply several times a day.

℞ Hydrarg. oxid. flav ....gr. xxx.
Ung. petrol ....ʒ i.

℞ Iodoform ....ʒ j.
Belladonna ointment ....ʒ ss.
Carbolic acid ....gr. x.
Simple cosmoline ....ʒ ss.

M. Apply this ointment thoroughly every day, after having each time cleansed the sore with antiseptic and touch with nitrate of silver very gently every third day.

For Rectal Ulcers

℞ Argent. nit ....gr. ij.
Aq. dest ....ʒ j.
M. S. Inject and wash out with warm water.

℞ Iodoform ....ℨ ss.
    Bismuth. subnit ....ℨ j.
    Morph. sulph ....gr. j.
    Ol. theobrom ....q. s.

M. Ft. suppositories No. X. S. Insert one, morning and night.

For Pruritis Ani

(*Goodsall & Miles.*)

℞ Pulv. zinc. oxidi....................gr. xxx.
    Liniment camphorae ....ℨ ss.
    Vaselin ....℥ i.

M. After cleaning parts with hot water apply on lint.

℞ Liq. plumbi subacelat ....ℨ i.
    Lactis ....ℨ viii.

M. Apply to excoriations.

℞ Fl. ext. krameria ....ℨ iv.
    Biborate sod. ....ℨ i.
    Aquae ....ad................℥ viii.

M. ℨ ii. to half cup warm water injected into bowel at bedtime.

(*Adler.*)

℞ Fl. ext. hamamelis ....ℨ i.
    Fl. ext. ergot ....ℨ ii.
    Fl. ext. hydrastis ....ℨ ii.
    Comp. tinc. benzoin ....ℨ ii.
    Carbolized olive or linseed oil, carbolic
        acid 5% ....ℨ v.

M. Injected into rectum.

℞ Ichthyol ....ℨ i.
    Ol. olivae ....℥ ii.

M. Apply to mucous membrane.

For Pruritis Ani Excoriations.

℞ Ung. credi ....℥ i.

Apply on lint every second day, dilute with vaseline when too irritating.

℞ Calomel ....gr. xviii.
   Vaseline ....℥ i.

Apply on lint every second day, dilute with vaseline when too irritating.

(Agnew.)

℞ Carbolic acid ....gr. xx.
   Sulphur ....℥ lll.
   Citrine ointment ....
   Simple cerate (or lanoline) av ....℥ ss.
M. Apply on lint.

(Hyde.)

℞ Ac. carbolici ....℥ iss.
   Glycerin ....℥ ii.
   Menthol ....℥ i or ℥ ss.
   Spirit. rectif ....gr.
   Aq. distill..gs...ad ....℥ viii.
M. Apply to parts.

For Pruritis Ani. (Parasitic form.)

℞ Camphor.
   Spts. rectif ....aa ℥ j.
   Adipis ....℥ j.
M. S. Inside and outside the rectum.

(Kelsey.)

℞ Saponis viridis.
   Ol. cadini ....j.
   Alcohol ....aa. ℥ j.

℞ Saponis viridis.
   Ol. cadini.
M. Alcohol ....aa ℥ j.

℞ Chloroformi ....fl. ℥ j.
   Ung. oxid. zinc ....℥ j.
M.

℞ Mur. cocaine ....gr. xv.
　Mur. morph ....gr. x.
　Acid carbol cryst ....ℨ j.
　Tinct. caoniti rad ....fl. ℨ iij.
　Unguent petrolii ....ℨ j.
M.

(Allingham.)

℞ Liq. carbo. deter. (Wright's) ....fl ℥ j.
　Glycerine ....fl ℥ j.
　Zinci. oxid. pulvi. ⎫
　Calamin, prep. 　　⎬ ....aa ℥ ss.
　Sulphuris precip. pulv................℥ ss.
　Aquae pur ....ℨ vj.

℞ Sodae biborat ....ℨ ij.
　Morph. hydrochlorate ....gr. xvi.
　Acid. hydrocyan. dilut ....fl ℥ ss.
　Glycerine ....fl ℥ ij.
　Aquae ....fl ℥ viij.
M.

℞ Chloral ....ℨ j.
　Camphorae ....ℨ j.
　Ung. petrol ....ℨ j.
M.

℞ Menthol ....ℨ j.
　Ol. amygd. dulc ....fl. ℥ j.
　Acid. carbol ....ℨ j.
　Zinc. oxid ....ℨ ij.
　Cerat. simp. ....ℨ ij.
M.

℞ Ung. picis ....ℨ iij.
　Ung. belladon ....ℨ ij.
　Tr. aconiti rad ....fl. ℥ ss.
　Zinci oxid ....℥ iij.
M.

℞   Ext. conii (freshly made) ....ʒ j.
     Lanolin ....ʒ ij.
M.

For Pruritis Ani (with external eruptions).

℞   Acid. salicyl ....gr. x.
     Spts. rectif ....ʒ j.

(Gant.)

℞   Boric acid.
     Stearate zinc ....aa ʒ ij.
     Talcum ....ʒ j.
M. Sig. Apply as dusting-powder.

(Gant.)

℞   Carbolic acid ....Ɔ j.
     Menthol ....gr. x.
     Camphor ....gr. x.
     Suet ....q. s. ad. ʒ j.
M. Sig. Apply freely two or three times daily after cleansing the parts.

(Gant.)

℞   Bismuth-oleate ointment (Morrow's) ...ʒ j.
     Carbolic acid ....gtt. x.
     Menthol ....Ɔ j.
M. Sig. Use in and outside the rectum morning and night.

(Gant.)

℞   Carbolic acid ....Ɔ j.
     Zinc oxide ....ʒ j.
     Gelanthum ....ʒ ij.
M. Sig. Apply to skin and mucosa two or three times daily when the itching is severe.

(Mathews.)

℞   Menthol ....ʒ j.
     Mur. cocain ..,,.....................gr. xx.

Alcohol.

Aquae. destill ....aa ℥ j.

M. Sig.   Apply on cloth.

(Tuttle.)

℞   Ungt. picis ....℥ iij.

Ungt. belladonnae ....℥ ij.

Tinct. aconiti ....℥ ss.

Ungt. aq. rosae ....℥ iij.

M. Sig.   Apply freely.

(Gant.)

℞   Ungt. picis ....℥ j.

Zinc. oxide ....℥ ij.

Ichthyol ....℥ j.

Ungt. aq. rosae ....ad. ℥ j.

M. Sig.   Apply on gauze.

(Bulkley.)

℞   Liq. carbonis detergens (Wright's) ....℥ j.

Glycerini ....℥ j.

Pulvis calaminae prep ....℥ ss.

Aquae ....℥ vj.

M. Sig.   Apply daily with brush and allow it to dry.

For Ring Worm

For Ring worm marginal Eczema.   (Wilkinson.)

℞   Sulphuris sublimata.

Picis liquidae.

Saponis viridis ....aa ℥ vj.

Terrae albae ....℥ iij.

Adipis suis ....℥ j.

M. et fiat unguentum.

Sig.   Apply to excoriated parts.

PERCENTAGE SOLUTIONS

Parts.	Per Cent.	Fl. ʒj.	Fl. ʒij.	Fl. ʒiij.	Fl. ʒiv.	Fl. ʒv.	Fl. ʒvj.	Fl. ʒvij.	Fluid ounce
1 in 1000	1/10	3/50	3/25	9/50	6/25	3/10	9/25	21/50	1/2
1 in 900	1/9	1/15	2/15	1/5	4/15	1/3	3/8	7/15	8/15
1 in 800	1/8	3/40	3/20	9/40	3/10	3/8	1/2	7/13	3/5
1 in 700	1/7	3/35	1/6	1/4	1/3	3/7	1/2	3/5	3/4
1 in 600	1/6	1/10	1/5	3/10	2/3	1/2	3/5	7/10	4/5
1 in 500	1/5	1/8	1/4	1/3	1/2	3/5	3/4	7/8	1
1 in 400	1/4	1/6	1/3	9/20	3/5	3/4	9/10	1 1/20	1 1/5
1 in 300	1/3	1/5	2/5	3/5	4/5	1	1 1/5	1 2/5	1 3/5
1 in 200	1/2	3/10	3/5	9/10	1 1/5	1 1/2	1 4/5	2 1/10	2 2/5
1 in 100	1	3/5	1 1/5	1 4/5	2 2/5	3	3 3/5	4 1/5	4 4/5
1 in 50	2	1 1/5	2 2/5	3 3/5	4 4/5	6	7 1/5	8 2/5	9 3/5
1 in 40	2 1/2	1 1/2	3	4 1/2	6	7 1/2	9	10 1/2	12
1 in 33 1/3	3	1 4/5	3 7/11	5 1/2	7 1/4	9	10 1/2	12 2/3	14 1/2
1 in 30	3 1/3	2	4	6	8	10	12	14	16
1 in 25	4	2 2/5	4 1/2	7 1/2	9 3/5	12	14 2/5	16 3/4	19 1/5
1 in 20	5	3	6	9	12	15	18	21	24
1 in 10	10	6	12	18	24	30	36	42	48
1 in 5	20	12	24	36	48	60	72	84	96
1 in 4	25	15	30	45	60	75	90	105	120
1 in 3	33 1/3	20	40	60	80	100	120	140	160
1 in 2	50	30	60	90	120	150	180	210	240

RULE. To find the number of grains required to make a solution of any given percentage first find the quantity of solution, in the top line; then, by referring to the percentage column, find the percentage desired. Draw lines at right angles from the quantity and percentage figures selected; the answer will be found where the lines intersect.

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